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GENESEE RIVER BASIN COMPREHENSIVE STUDY OF WATER AND RELATED LA--ETC(U)
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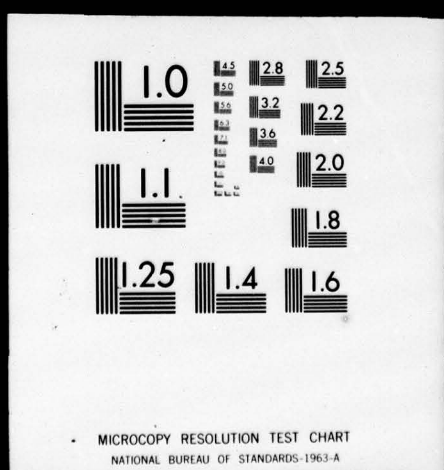

DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

IN REPLY REFER TO NCBED-PB

10 June 1970

Dear Sir:

Inclosed is one complete set, eight volumes, of the final "Field Report" for the Genesee River Basin Study. This complete set consists of the following:

Volume I	-	Summary Report
Volume II	-	Appendix A - History
	-	Appendix B - Plan Formulation
	-	Appendix C - Project Designs and Cost Estimates
Volume III	-	Appendix D - Economic Base Study
Volume IV	-	Appendix E - Hydrology
	-	Appendix F - Flood Control
Volume V	-	Appendix G - State Water Laws
	-	Appendix H - Water Supply & Water Quality Management
	-	Appendix I - Groundwater Resources
Volume VI	-	Appendix J - Agricultural Studies
	-	Appendix K - Sedimentation
Volume VII	-	Appendix L - Hydroelectric Power
	-	Appendix M - Outdoor Recreation
	-	Appendix N - Fish & Wildlife
Volume VIII	-	New York State Supplement

It should be noted that this report of the Genesee River Basin Coordinating Committee was prepared at field level and presents a proposed plan for the development and management of the water and related land resources of the Genesee River Basin and the agricultural management of the Ontario Lake Plains Service Area. This report is subject to review by interested Federal agencies at the departmental level, by the Governors of the affected States, and by the Water Resources Council prior to its transmittal to the President of the United States for his review and ultimate transmittal to the Congress for its consideration in authorizing Federal participation in implementing the plan.

GENESEE RIVER BASIN STUDY
VOLUME INDEX
AND
LIST OF APPENDICES

6

1

GENESEE RIVER BASIN
COMPREHENSIVE
STUDY OF
WATER AND RELATED LAND RESOURCES.

Volume II.

APPENDIX A.
HISTORY OF INVESTIGATION.

Appendix B.
Plan Formulation.

Appendix C.
Project Designs and Cost Estimates.

9 Final rept.

12 574p.

Prepared by
U.S. Army Engineer District, Buffalo
Corps of Engineers
Buffalo, New York 14207

11 June 1969

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GENESEE RIVER BASIN COMPREHENSIVE STUDY

APPENDIX A

HISTORY OF INVESTIGATION

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GENESEE RIVER BASIN COMPREHENSIVE STUDY
APPENDIX A
HISTORY OF INVESTIGATION

AUTHORITY

1. A comprehensive study for the Genesee River Basin was authorized by the Committee on Public Works of the United States Senate in a resolution adopted 1 February 1962. The overall study was requested by the New York State Water Resources Commission and the authorizing resolution was sponsored by Senator Jacob K. Javits of New York. The area involved is approximately 2,479 square miles of which 2,383 square miles are within the counties of Allegany, Cattaraugus, Genesee, Livingston, Monroe, Ontario, Orleans, Steuben and Wyoming in the State of New York and about 96 square miles are in the county of Potter in the Commonwealth of Pennsylvania.

2. The authorizing resolution for the overall study reads:

> "RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Board of Engineers for Rivers and Harbors created under Section 3 of the River and Harbor Act approved 13 June 1902, be and is hereby requested to review the reports of the Genesee River, New York, contained in House Document 615, 78th Congress, 2nd Session, and other reports, with a view to determining whether any modification of the basin-wide plans should be made at this time with respect to improvements for flood control, navigation, and other related water and land resources. In making this study the Corps of Engineers shall coordinate fully with the State of New York and Commonwealth of Pennsylvania and other Federal agencies concerned to insure full consideration of all views and requirements of all interrelated programs, which those agencies may develop with respect to flood prevention, water supply, stream pollution abatement, recreation, fish and wildlife management, irrigation, soil conservation, hydro-electric power and related water and land resources."

3. The above study authorization differs from the ordinary authorization in that it states "...In making this study the Corps of Engineers shall coordinate fully with the State of New York and Commonwealth of Pennsylvania and other Federal agencies concerned...". Generally a resolution only calls for full coordination with other Federal agencies and review by the States. The State of New York had the resolution intentionally written in the above manner to provide the mechanism for their participation in the study.

4. The United States Department of Agriculture participated in the study under the authority contained in Section 6 of Public Law 566, 83rd Congress, as amended. The work was carried out for the United States Department of Agriculture in accordance with the "Memorandum of Understanding" dated 2 February 1956, between the Soil Conservation Service, Forest Service and Economic Research Service.

5. The United States Department of the Interior, Federal Water Pollution Control Administration initiated their portion of the study as the Public Health Service, Department of Health, Education and Welfare. They participated in the study under the authority of the Federal Water Pollution Control Act, Public Law 660, 84th Congress, as amended by Public Law 87-88 (33 U.S.C. 466 et seq.); and the "Memorandum of Agreement," dated 4 November 1958 between the Department of Army and the Department of Health, Education and Welfare, relative to the Water Supply Act of 1958, Public Law 500, 85th Congress, as amended by Public Law 87-88 (43 U.S.C. 390b).

6. The United States Department of the Interior, Bureau of Outdoor Recreation participated in the study under the authority contained in their Bureau's Organic Act, Public Law 88-29, May 1963 (77 Stat. 49).

7. The United States Department of the Interior, Bureau of Sport Fisheries and Wildlife participated in the study under the authority of the Fish and Wildlife Coordination Act, Public Law 85-624 (28 Stat. 401 as amended; 16 U.S.C. 661-666 inc.), in cooperation with the New York State Conservation Department.

POLICIES AND PROCEDURES

8. POLICY

The basic policies of this comprehensive report were governed by Senate Document No. 97, 87th Congress, 2nd Session.

9. PLANNING POLICIES

All viewpoints, national, regional, State, and local were considered and taken into account in planning resource use and development. Regional, State and local objectives were considered and evaluated within a framework of national public objectives and available projections of future national conditions and needs. Similarly, the projections of future conditions and needs of the region, State and localities, developed by the Economic Base Study, were considered in plan formulation.

10. OBJECTIVES

The basic objective in the formulation of plans for the Genesee River Basin is to provide the best use, or combination of uses, of related water and land resources to meet all foreseeable short and long-term needs. In pursuit of this basic conservation objective, full consideration was given to each of the following objectives and reasoned choices made between them when they conflict:

a. Development: National economic development, and development of each region within the country, is essential to the maintenance of national strength and the achievement of satisfactory levels of living. Related water and land resources development and management are essential to economic development and growth, through concurrent provision for:

(1) Adequate supplies of surface and ground waters of suitable quality for domestic, municipal, agricultural, and industrial uses;

(2) Water quality facilities and controls to assure water of suitable quality for all reasonable water uses;

(3) Hydroelectric power where its provision can contribute advantageously to a needed increase in power supply;

(4) Flood control or prevention measures to protect people, property, and productive lands from flood losses where such measures are justified and are the best means of avoiding flood damage;

(5) Land stabilization measures where feasible to protect land for beneficial purposes;

(6) Drainage measures where the best use of land would be justifiably obtained;

(7) Watershed protection and management measures where they will conserve and enhance resource use opportunities;

(8) Outdoor recreational and fish and wildlife opportunities where these can be provided or enhanced by development works; and

(9) Any other means by which development of related water and land resources can contribute to economic growth and development.

b. Preservation: Stewardship in the long-term interest of natural beauty requires in particular instances that:

(1) There be protection and rehabilitation of resources to insure availability for their best use when needed;

(2) Open space, green space, and wild areas of rivers, lakes, beaches, and related land areas be maintained and used for recreational purposes; and

(3) Areas of unique natural beauty, historical and scientific interest be preserved and managed primarily for the inspiration, enjoyment and education of the people.

c. Well-being of people: Well-being of the people shall be the overriding determinant in considering the best use of water and related land resources. Hardship and basic needs of particular groups within the general public shall be of concern, but care shall be taken to avoid resource use and development for the benefit of few or the disadvantage of many. Policy requirements and guides established by the Congress will be observed, in particular, those aimed at safeguarding the interests of all our people in assuring that the best use will be made of our natural resources.

11. PROCEDURES AND CONTROLS

In the absence of guidelines for Type II studies, it was the consensus of the Coordinating Committee that the "Guidelines for Framework Studies," by the Interdepartmental Staff Committee (ISC), ad hoc Water Resources Council (WRC), dated 10 June 1965 should be considered where applicable. In the cases where the guidelines did not appear applicable, the general format of a typical Corps of Engineers report was to be followed.

12. This comprehensive report will be submitted to higher authority in accordance with the "Guidelines for Submission and Review of Coordinated Comprehensive (Type II) River Basin Reports" by the Water Resources Council, dated 17 May 1967. The guidelines appear as attachment 1 to this appendix.

13. The cooperation and coordination for the study between the Federal and State agencies was accomplished through the formation of a Coordinating Committee which is described in detail later in this appendix.

14. The overall study was sub-divided into 13 tasks or technical work assignments with one agency designated for responsibility for each task, assisted by specified "cooperating agencies." A plan of survey was prepared and approved by the Coordinating Committee which spelled out the actual work to be accomplished by each task group.

15. In order to minimize refinement studies, all participating agencies and task groups were instructed to adhere to the principle of terminating studies at the point where it became apparent that further study would not produce justifiable improvements.

16. The participating agencies and task groups were to develop plans as a result of their studies, which would: (1) identify the general nature and scope of water resource development needs which will be encountered in future periods, confining planning studies to the minimum detail and scope necessary to meet these requirements; (2) define and evaluate in sufficient detail to comprise a basis for authorization, only those projects for which Federal authorization will be required to permit necessary construction to be initiated in the next 10 to 15 years; and (3) identify the general nature and scope of the parts of the plan which should be undertaken under non-Federal or other Federal programs to supplement or utilize the projects for which authorization is sought, limiting study detail to the minimum necessary to insure that proper balance has been achieved between the two types of projects.

PRIOR REPORTS AND INVESTIGATIONS

17. EARLY INVESTIGATIONS

While the records of floods on the Genesee River date back to 1800, no study of remedial measures was undertaken until after the extensive damage in 1865. Following the great flood of 1865 a series of studies and reports on flood control measures were made by Governmental agencies and by private interests. Periodic investigations have also been made of sites for water supply and power development projects. In 1889-1893 the State of New York investigated the possibility of reservoirs on the Genesee River for water supply for the Erie Canal. The first sites studied included several in the Mount Morris Gorge, but due to the development of other water supply sources for the canal the State of New York did not proceed with development of reservoirs on the Genesee River.

18. INVESTIGATIONS BY LOCAL GOVERNMENT

In 1905 a special committee was appointed by the Mayor of Rochester, and another committee by the Chamber of Commerce to investigate and report on flood conditions. A report was submitted covering the history of previous floods and suggesting remedies. In 1928 the City Manager of Rochester enlarged the scope of an investigation for a Civic Center for the city of Rochester to include the general subject of flood protection. A detailed report referred to as the "Fisher Report" on flood conditions was published in 1937.

19. INVESTIGATIONS BY NEW YORK STATE

The Water Supply Commission of the State of New York, between the years 1907-1910 made a study of the Genesee River for flood control and power. Two sites were found for multiple purpose reservoirs, one near Mount Morris and the other near Portageville. The former New York State Water Pollution Control Board published Survey Report #1 and #2 entitled the "Upper" and "Lower Genesee River Drainage Basin," in 1955 and 1961 respectively. These reports recommended classification and assigned standards of quality and purity for various reaches of the tributaries and main stem of the Genesee River. The New York State Water Resources Commission in November 1963, prepared a preliminary investigation of Conesus Lake Basin.

20. DEVELOPMENT BY PRIVATE UTILITIES

In 1923-1926 the Rochester Gas and Electric Corporation acquired land in the present Mount Morris Reservoir area for future construction of a dam and power plant at a site approximately one-quarter mile downstream of the present site. The corporation deeded to the State of New York, for park purposes, excess lands not required for the reservoir. In 1927 the Commonwealth Power Company applied to the Conservation Department of the State of New York for a license to develop power on the Genesee River in the vicinity of Portageville. This application was rejected, as a clause in the grant of Letchworth Park lands to the State stipulated that these lands were to be used for park purposes in perpetuity.

21. PRIOR FEDERAL REPORTS AND STUDIES

Existing Federal projects and studies in the Genesee River Basin shown on figure A1 (by the Corps of Engineers, unless otherwise noted) are as follows:

a. A preliminary examination and survey for flood control on the Genesee River was authorized under Section 6 of the Flood Control Act, Public Law 738, 74th Congress, approved 22 June 1936. This survey report dated 16 May 1941 and published in House Document No. 615, 78th Congress, 2nd Session, recommended construction of an earth-fill dam in the Genesee River near Mount Morris;

b. A proposed plan for development of the Genesee River Basin by the Federal Power Commission was prepared February 1943;

c. Mount Morris Dam and Reservoir authorized by Section 10 of the Flood Control Act, Public Law 534, 78th Congress, approved

22 December 1944. Construction was initiated in March 1948 and completed in 1952;

d. A survey report dated 30 July 1945 and published in House Document No. 206, 80th Congress, 1st Session, recommended channel improvements in Canaseraga Creek for flood control in the vicinity of Dansville, New York;

e. Flood control project at Dansville and Vicinity, New York was authorized by the Flood Control Act of 1948, Public Law 858, 89th Congress, approved 30 June 1948. This project has been placed in an inactive category;

f. A survey report dated 12 March 1948 and published in House Document No. 232, 81st Congress, 1st Session, recommended channel improvements for flood control at Wellsville and Caledonia, New York;

g. A Review of Reports on the Genesee River with particular reference to Angelica Creek, Allegany County, New York, was authorized by resolution adopted by the Committee on Public Works House of Representatives, 27 May 1949. The report submitted 18 March 1955 recommended that improvements were not considered justified;

h. Flood control project at Wellsville, New York, authorized by the Flood Control Act of 1950, Public Law 516, 81st Congress, approved 17 May 1950. Construction was initiated July 1956 and substantially completed November 1957;

i. Flood control project at Caledonia, New York, authorized by the Flood Control Act of 1950, Public Law 516, 81st Congress, approved 17 May 1950. This project has been classified as deferred for restudy;

j. A comprehensive study New England - New York Inter-Agency Committee, conducted under the general authority of Section 205 of the Flood Control Act of 1950, Public Law 516, 81st Congress, and other acts. Chapter XXXIII of this report was a detailed study of the Genesee River and was completed in 1954;

k. A snagging and clearing project on the Genesee River and Dyke Creek at Wellsville, New York was completed in 1951;

l. An unfavorable preliminary examination of the Allegheny-Genesee waterway barge navigation, submitted to Congress 13 April 1953;

m. A snagging and clearing project in Canaseraga Creek from Groveland Station to the Genesee River, completed in 1954;

n. A snagging and clearing project in Keshequa Creek, in the vicinity of Nunda, New York, completed in 1955;

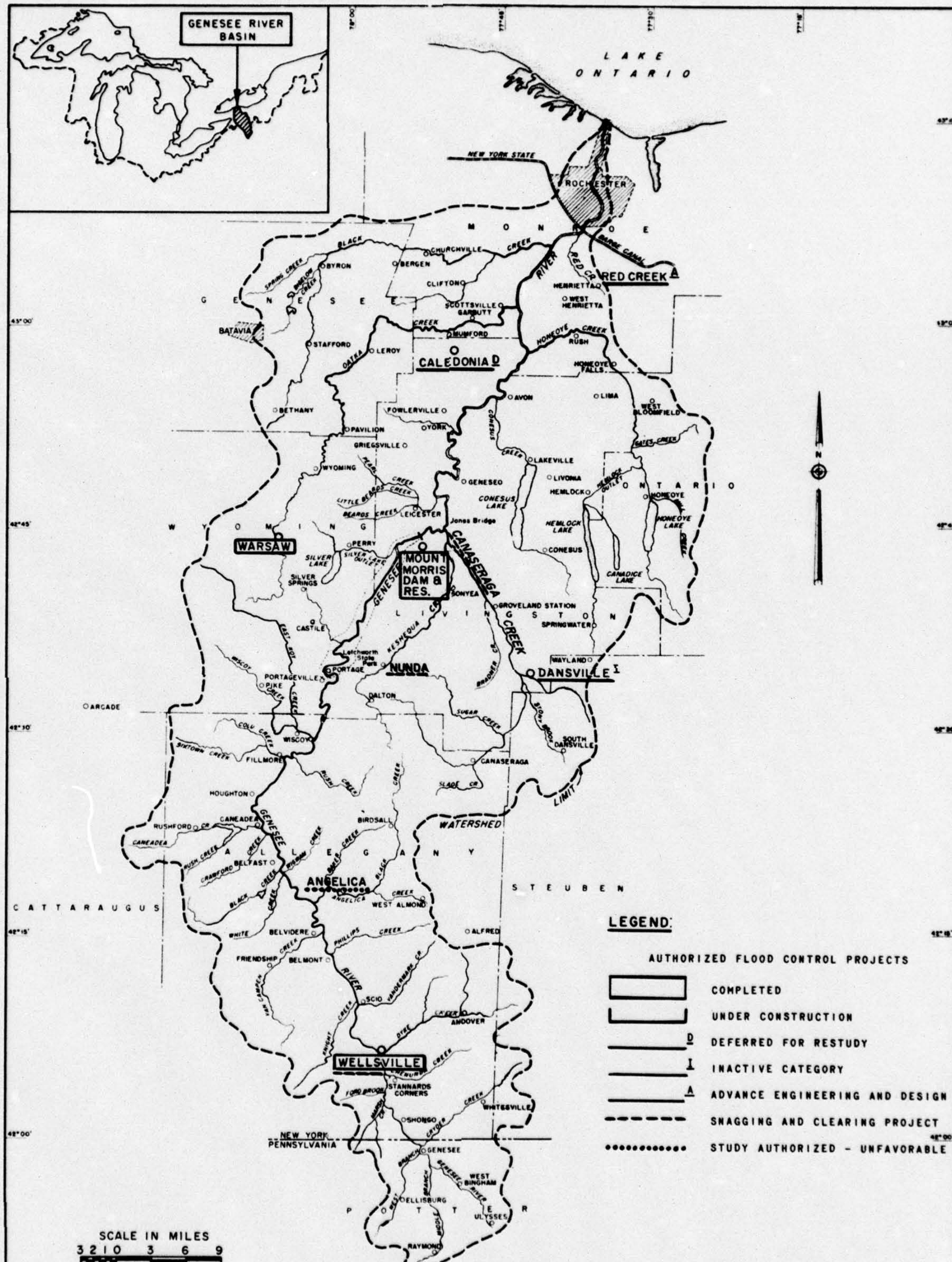
o. A study of flood problems at Honeoye Lake and Honeoye Creek, initiated by the Soil Conservation Service in 1958 under Public Law 566, 83rd Congress.

p. A Review of Reports on the Genesee River, in the vicinity of Dansville, New York with respect to Canaseraga Creek, was authorized by resolution adopted by the Committee on Public Works House of Representatives, 3 June 1959. This Corps study was concurrent with a study by the Soil Conservation Service under Public Law 566, 83rd Congress. The Canaseraga Creek study by both agencies was combined with the Genesee River Comprehensive Study.

q. A reconnaissance report on Oatka Creek at Warsaw, New York for flood control under Public Law 685, 84th Congress was submitted 27 September 1960. Detailed project report was authorized by Chief of Engineers, 6 January 1961. Construction of the project was started in October 1966 and was completed 24 July 1968.

r. A design memorandum for rectification of deficiencies in completed local flood protection project Wellsville, New York was authorized by Office, Chief of Engineers, 22 March 1962. The report was submitted to higher authority 22 April 1966; and

s. Flood control project Red Creek, Monroe County, New York was authorized by the Flood Control Act of 1966, Public Law 89-789, approved 7 November 1966. This project was initiated by the Soil Conservation Service in 1961 under authority of Public Law 566, 83rd Congress, and the Corps of Engineers was requested to participate in October 1961 under authority of Public Law 685, 84th Congress. As the study developed, the scope of the project exceeded the limitations of Public Law 685, 84th Congress, and the study was transferred by authority Office, Chief of Engineers, 20 March 1963 to the Genesee River Basin Comprehensive Study. An interim report was submitted in August 1965 and published in Senate Document No. 107, 89th Congress, 2nd Session.



LOCATION OF PROJECTS AND STUDIES FOR GENESEE RIVER BASIN

FIGURE A1

COORDINATING COMMITTEE

22. PURPOSE

A Genesee River Basin Coordinating Committee was formed to: provide an organization for full and continuing exchanges of views during the study; advise and assist all participating agencies with regard to objectives, work assignments, and schedules; assist in the resolution of study problems as they arose; and make periodic review of progress.

23. FORMATION

In order to provide for active participation of the several interested Federal departments and agencies and the States in accomplishing an integrated plan for comprehensive development, it was proposed to form a Coordinating Committee consisting of one representative each from the Department of the Army, Department of the Interior, Department of Agriculture, Department of Commerce, Department of Health, Education and Welfare, the Federal Power Commission, the State of New York and the Commonwealth of Pennsylvania. The District Engineer, U. S. Army Engineer District, Buffalo, was assigned the responsibility for the investigation in response to the Congressional resolution and designated chairman of the committee by Cyrus R. Vance, Secretary of the Army.

24. The Secretary of the Army initiated the formation of the Coordinating Committee by requesting the Secretaries of the above mentioned Federal agencies to designate a formal representative. Exhibit No. 1 is a copy of the letter which the Secretary of the Army sent on 27 November 1962 to the several Secretaries involved in the study.

25. Brigadier General T. DeF. Rogers was instructed to send similar letters to the Governors of New York and Pennsylvania. Brigadier General Rogers requested the Governors by letter dated 17 December 1962 to designate a formal representative and alternate for the Coordinating Committee.

26. The several Secretaries and Governors complied with the request to designate a formal representative. Table A1 shows the originally designated members of the Coordinating Committee.

TABLE A1 - Original Genesee River Coordinating Committee

Agency	Member	Alternate
Department of the Army	Col. Leon J. Hamerly (Chairman) District Engineer Buffalo District, Corps of Engineers	Lt. Col. William F. Pence Deputy District Engineer Buffalo District
Department of the Interior	Mark Abelson Regional Coordinator Northeast Region	-
Department of Agriculture	Irving B. Stafford State Conservationist Soil Conservation Service	Robert D. Perry, Assistant State Conservationist Soil Conservation Service
Department of Commerce	George E. Kirk Hydraulics Engineer Bureau of Public Roads	John M. Williams Meteorologist-in-Charge Rochester, Weather Bureau
Department of Health, Education & Welfare	William Q. Kehr Project Director Great Lakes - Illinois River Basins Project Public Health Service	Charles R. Ownbey Chief, Planning & Reports Great Lakes - Illinois River Basins Project Public Health Service
Federal Power Commission	Day J. Wait Regional Engineer New York Region	John H. Spellman Deputy Regional Engineer New York Region
State of New York	Dr. Harold G. Wilm Conservation Commissioner Conservation Department	F. W. Montanari Assistant Commissioner Div. of Water Resources Conservation Department
Commonwealth of Pennsylvania	Dr. Maurice K. Goddard Secretary of Forests and Waters	Alan J. Sommerville Chief, Water Resources Development Engineer, Dept. of Forests & Waters

27. The letters officially designating the members of Coordinating Committee are shown as exhibits A2 to A7.

28. The Coordinating Committee during the course of the study has had changes in personnel due to retirements, resignations, transfer of duty stations, transfer of agencies and creation of a new Department, the Department of Transportation. Table A2 shows the membership of the Coordinating Committee as of 1 April 1968 and notes the changes that have occurred during the study.

TABLE A2 - Genesee River Coordinating Committee 1 April 1968

Agency	Member	Alternate
Department of the Army	Col. A. L. Wright (1) (Chairman) District Engineer Buffalo District, Corps of Engineers	(2) Deputy District Engineer Buffalo District, Corps of Engineers
Department of the Interior	Mark Abelson Regional Coordinator Northeast Region	Designated by member as appropriate
Department of Agriculture	Wallace L. Anderson (3) State Conservationist Soil Conservation Service	Richard Hogue (4) Asst. State Conservationist Soil Conservation Service
Department of Commerce	George E. Kirk (5) Hydraulics Engineer	John M. Williams Meteorologist-in-Charge Rochester, Weather Bureau
Department of Health, Education & Welfare	Ralph J. Van Derwerker (6) Acting Associate Regional Health Director Public Health Service Region II	
Federal Power Commission	John H. Spellman (7) Deputy Regional Engineer New York Region	Angelo M. Monaco (8) New York Region
State of New York	F. W. Montanari (9) Assistant Commissioner Div. of Water Resources Conservation Department	Nicholas L. Barbarossa (10) Assistant Director Div. of Water Resources Conservation Department
Commonwealth of Pennsylvania	Dr. Maurice K. Goddard Secretary of Forests & Waters	Alan J. Sommerville Chief, Water Resources Development Engineer Dept. of Forests & Waters

(1) Former Chairman, Colonel Leon J. Hamerly, Transferred, 1 Feb. 1962 to 30 June 1964

Former Chairman, Colonel R. Wilson Neff, Transferred, 1 July 1964 to 30 June 1967

(2) Former Alternate, Lt. Col. William F. Pence, Transferred, 1 Feb. 1962 to 24 July 1964

Former Alternate, Lt. Col. James M. Neil, Transferred, 3 July 1964 to 20 May 1966

Former Alternate, Major Linwood Lufkin, Transferred, 10 Jan. 1967 to 18 Mar. 1968

(3) Former State Conservationist, Irving B. Stafford, Retired, 22 Apr. 1963 to 31 Jan. 1964, refer to exhibit A8

(4) Former Alternate, Robert D. Perry, Retired, 22 Apr. 1963 to 31 Dec. 1965

(5) George E. Kirk, continuing to represent Department of Commerce, although Bureau of Public Roads became the Federal Highway Administration under the newly created Department of Transportation on 1 April 1967, refer to exhibit A9. The Department of Transportation was created by Public Law 89-670, approved 15 October 1966.

(6) William Q. Kehr, Federal Water Pollution Control Administration (formerly U.S. Public Health Service) continued to act in the capacity of a "Member" after the transfer of F.W.P.C.A. to the Department of the Interior on 10 May 1966, until the Department of Health, Education and Welfare appointed a new "Member" on 24 August 1966, refer to exhibit A10.

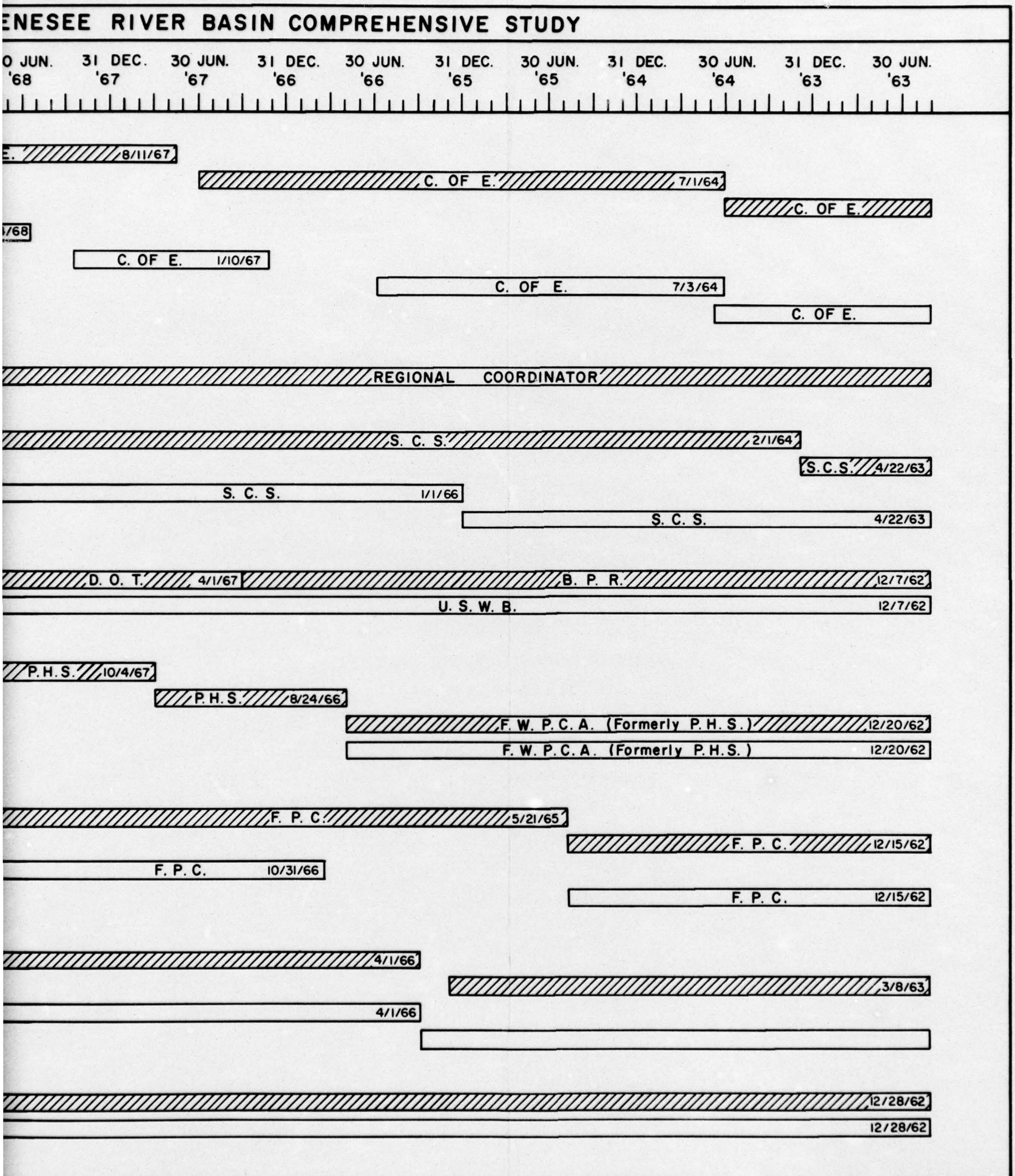
Former Member, Sylvan C. Martin, Transferred, 24 Aug. 1966 to 4 Oct. 1967, refer to exhibit A11.

(7) Former Regional Engineer, Day J. Wait, Retired, 12 Dec. 1962 to 20 May 1965, refer to exhibit A12.

(8) Angelo M. Monaco, appointed "Alternate" by Federal Power Commission, Regional Engineer, 31 October 1966, refer to exhibits A13 and A14.

COORDINATING COMMITTEE – GENESEE RIVE

DEPARTMENT	COORDINATING COMMITTEE MEMBER	COORDINATING COMMITTEE ALTERNATE	NAME OF REPRESENTATIVE	30 JUN. '69 – 31 DEC. '68 – 30 JUN. '68 – 31 DEC. '67
DEPARTMENT OF ARMY			COL. A.L. WRIGHT	C. OF E. 8/11/67
			COL. R. WILSON NEFF	
			COL. LEON J. HAMERLY	
			MAJ. B.R. SCHLAPAK	C. OF E. 6/14/68
			MAJ. LINWOOD LUFKIN	C. OF E
			LT. COL. JAMES M. NEIL	
			LT. COL. WILLIAM F. PENCE	
DEPARTMENT OF INTERIOR			MARK ABELSON	
DEPARTMENT OF AGRICULTURE			WALLACE L. ANDERSON	
			IRVING B. STAFFORD	
			RICHARD HOGUE	
			ROBERT D. PERRY	
DEPARTMENT OF COMMERCE			GEORGE E. KIRK	D. O. T.
			JOHN M. WILLIAMS	
DEPARTMENT OF HEALTH EDUCATION AND WELFARE			R.J. VAN DERWERKER	P.H.S. 10/4/67
			SYLVAN C. MARTIN	
			WILLIAM Q. KEHR	
			CHARLES R. OWNBEY	
FEDERAL POWER COMMISSION			JOHN H. SPELLMAN	
			DAY J. WAIT	
			ANGELO M. MONACO	F.
			JOHN H. SPELLMAN	
STATE OF NEW YORK			F. W. MONTANARI	
			DR. HAROLD G. WILM	
			N.W. BARBAROSA	
			F. W. MONTANARI	
COMMONWEALTH OF PENNSYLVANIA			MAURICE K. GODDARD	
			A. J. SOMMERVILLE	



A15 (A16)

FIGURE A2

(9) Dr. Harold G. Wilm, Conservation Commissioner, Resigned, 8 March 1963 to 3 February 1966. F. W. Montanari, appointed 1 April 1966, refer to exhibit A15.

(10) Nicholas L. Barbarossa, appointed alternate for New York State to replace former alternate, F. W. Montanari, 1 April 1966, refer to exhibit A15.

29. The membership of Coordinating Committee as presented in tables A1 and A2 is graphically shown as figure A2 with dates of appointment of the "Members" and "Alternates."

30. The letters officially designating the changes in members of the Coordinating Committee are shown as exhibits A8 to A15.

31. PLAN OF SURVEY

One of the first major tasks of the Coordinating Committee was the preparation, review and approval of a "Plan of Survey" for the study. The "Plan of Survey" included the following: objectives of planning; policies and procedures; available pertinent data; desires of local interests; economic study requirements; the major tasks and technical studies; work assignments of each agency; estimate of cost of work required by the participating agencies; a work schedule; outlines of the final report and appendices; and applicable constraints and controls.

32. The first draft of the "Plan of Survey" was submitted to the Coordinating Committee in April 1963. The final version was completed and distributed in August 1964 with revisions as required by higher authority being completed 12 April 1965.

33. TASK GROUPS

In order that the major tasks and technical studies could be performed efficiently, the study was divided into thirteen task groups with a responsible agency and cooperating agencies indicated for each. The organization chart, figure A3, shows the thirteen task groups and the agencies involved in each task. It should be noted that the State of New York has been designated to chair four of these task groups. The State of New York willingly accepted the chairmanship of these task groups, the costs involved and considered it their proper participation under the wording of the study's authorization.

34. The task groups were governed by the procedures or guidelines established by the Coordinating Committee which were as follows:

a. PURPOSE

(1) The purpose of each task group will be to develop pertinent technical information for a specific task, as briefly outlined in paragraph 35 of this appendix; and

(2) To compile the aforesaid information into a task group report for incorporation in the overall final basin report.

b. ORGANIZATION

(1) A task group will consist principally of personnel at the working level;

(2) Each task group will have one agency appointed as the agency responsible for its activities;

(3) Participating or cooperating agencies will be named; and

(4) Where practicable, an individual will be named at the working level, who may be readily contacted for information pertaining to the task group.

c. RESPONSIBILITIES

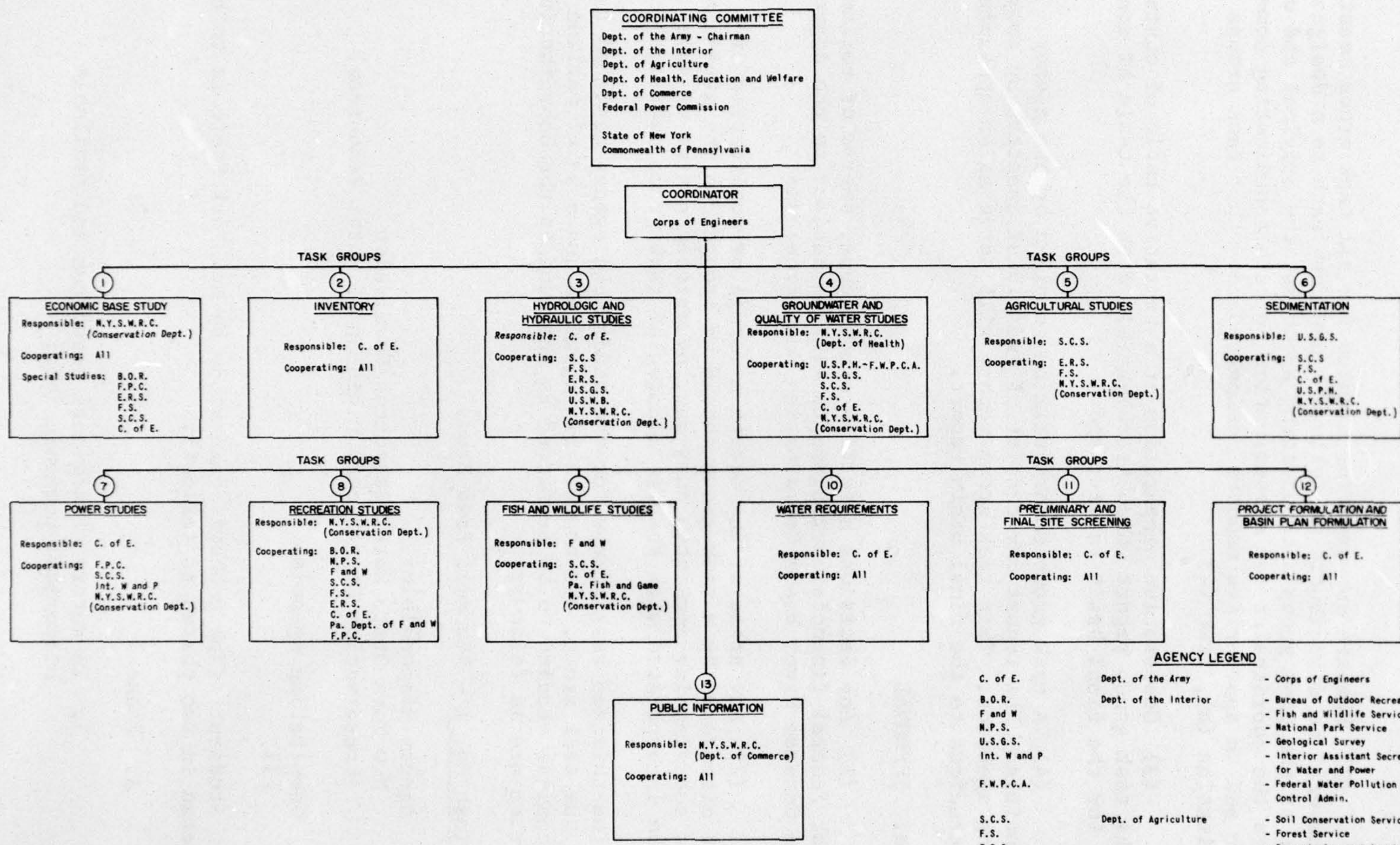
(1) The agency responsible will call meetings of the task group when deemed necessary or as suggested by a cooperating agencies; and

(2) A concise work outline for the task group will be prepared by the agency responsible, with the aid of cooperating agencies. Efforts as outlined for agencies within a task group should conform to work outlines approved by the Coordinating Committee, with respect to scope, degree of refinement and funding arrangements. Where possible, work outlines should indicate expected target dates for completion of important phases by the task group; also approximate dates when support data may be needed from other agencies or task groups.

d. REPORTS

(1) The agency responsible will include task group progress with the agency's own quarterly status report.

GENESEE RIVER BASIN COMPREHENSIVE STUDY
ORGANIZATION CHART



AGENCY LEGEND

C. of E.	Dept. of the Army	- Corps of Engineers
B.O.R.	Dept. of the Interior	- Bureau of Outdoor Recreation
F and W		- Fish and Wildlife Service
N.P.S.		- National Park Service
U.S.G.S.		- Geological Survey
Int. W and P		- Interior Assistant Secretary for Water and Power
F.W.P.C.A.		- Federal Water Pollution Control Admin.
S.C.S.	Dept. of Agriculture	- Soil Conservation Service
F.S.		- Forest Service
E.R.S.		- Economic Research Service
U.S.P.H.	Dept. of Health, Education and Welfare	- Public Health Service
U.S.W.B.	Dept. of Commerce	Environmental Science Services Admin.
F.P.C.	Federal Power Commission	
N.Y.S.W.R.C.	New York State	- Water Resources Commission
Pa. Dept. of F & W	Pennsylvania	- Department of Forests and Waters
Pa. Fish and Game		- Fish and Game Commission

REVISED 6-30-69

FIGURE A3

(2) Prepare summary type minutes for all task group meetings. Minutes will be distributed as follows: one copy each to a designated member of the task group's cooperating agencies, the original and one copy to the coordinator for dissemination to each coordinating committee member and to appropriate members designated for other task groups under Organization (b), item (4).

(3) Cooperative preparation of a tentative table of contents for the task group report which is compatible with the table of contents for the final basin report; and

(4) A task group report will be compiled by the agency responsible. The report may consist of individual chapters by cooperating agencies. This task group report will serve as an appendix or appendices to the final basin report.

e. APPROVAL

(1) Any decisions affecting study scope, degree of refinement or Federal financial arrangements will be subject to the approval of the Genesee River Basin Coordinating Committee; and

(2) Any areas of inadequate coverage or duplication of effort discovered by a task group should be brought to the attention of the coordinating committee chairman, by written notice of same (May be incorporated with summary minutes of task group meetings).

35. The thirteen task groups for the study, the agency assigned to chair the task group, the cooperating agencies and a brief outline of technical studies to be performed as approved by the Coordinating Committee are as follows:

Task No. 1 - Economic Base Study

Agency Responsible:
New York State Water Resources Commission
(Conservation Department, Division of Water Resources)

Cooperating Agencies:
All

Studies: (The economic base study by New York State is to be conducted in two phases as follows):

a. Phase I

1. Inventory of regional resources and available historical economic data;

2. Analyses of past growth and the present economy;

3. Delimitation of planning sub-areas of the Genesee River Service Area;

4. Preliminary analyses of the national and regional economies to determine dominant trends affecting the Genesee River Basin Service area;

5. Preliminary analyses of the adverse economic effects of failure to develop water supplies of adequate quantity and quality; and

6. Development of the method to be used to make population and economic projections for Service Area.

b. Phase II

1. Complete the economic analyses of principal water consuming industries; and

2. Develop final population and employment projections for Service Area.

Special Studies:

a. Power Supply and Requirements in the Basin
Federal Power Commission

b. Inventory of Existing Public Recreation Areas
Bureau of Outdoor Recreation

c. Agricultural Economy
Economic Research Service

d. Forest Economy
U. S. Forest Service

e. Mineral Resources
Corps of Engineers

<u>Task No. 2</u> - Inventory

Agency Responsible:
Corps of Engineers

Cooperating Agencies:

All

Studies:

Inventory of reference material with annotated bibliography, preparation of same by each task group to accompany their appendix or appendices, for the final basin report.

Task No. 3 - Hydrologic and Hydraulic Studies

Agency Responsible:

Corps of Engineers

Cooperating Agencies:

Soil Conservation Service
Economic Research Service
U. S. Forest Service
U. S. Geological Survey
U. S. Weather Bureau
N.Y.S. Water Resources Commission (Conservation Dept.)

Studies:

a. Field surveys at key localities to obtain hydrologic, hydraulic and flood damage data.

Corps of Engineers (Main stem)
Soil Conservation Service (Tributaries)
U. S. Forest Service (Forestry phase)
U. S. Geological Survey (Flow data)

b. Hydrologic studies to include development of routing procedures for the basin, unit hydrographs, and volume and frequency relations.

Corps of Engineers (Basin-wide studies)
Soil Conservation Service (Sub-watersheds and agricultural phase)
U. S. Geological Survey (Basic data and low-flow analysis)
U. S. Forest Service (Forestry phase)
U. S. Weather Bureau (Basic data)

c. Hydraulic studies related to remedial measures by reservoirs, local protection projects and other means.

Corps of Engineers
Soil Conservation Service
Economic Research Service
U. S. Forest Service

d. Flood damage studies for pertinent areas to determine magnitude of probable losses under present conditions, and expected future losses.

N.Y.S. Water Resources Commission (Conservation Dept.) - Economic base study data.
Economic Research Service
Soil Conservation Service
Corps of Engineers

e. Stream flow regulation studies to meet demonstrated needs for water supply, irrigation, hydroelectric power, navigation, recreation, flood control, fish and wildlife management, and water quality management.

Determination of needs at specific localities for their particular fields of interest:

All Agencies (under Task No. 10)

Investigation of storage sites to meet needs:

Corps of Engineers
Soil Conservation Service

Task No. 4 - Groundwater and Quality of Water Studies (Quality studies to include surface and subsurface water)

Agency Responsible:
New York State Water Resources Commission (Department of Health)

Cooperating Agencies:
Federal Water Pollution Control Administration (formerly U. S. Public Health Service)
U. S. Geological Survey
Soil Conservation Service
U. S. Forest Service
Corps of Engineers
N.Y.S. Water Resources Commission (Conservation Dept.)

Studies:

a. Prepare work plan and outline responsibility of major assignments.

N.Y.S. Water Resources Commission (Health Dept.)

b. Inventory present water use.

N.Y.S. Department of Health assisted by Federal Water Pollution Control Administration

c. Flow measurements.

U. S. Geological Survey

d. Water quality, including Monitoring Stations.

N.Y.S. Water Resources Commission (Health Dept.) - Coordinate and integrate activities.
Federal Water Pollution Control Administration - Assign staff and provide laboratory supplies.

e. Future water quality management needs.

Federal Water Pollution Control Administration

f. Determine potential sources of groundwater supplies.

U. S. Geological Survey

g. Waste assimulation capacity.

N.Y.S. Water Resources Commission (Health Dept.)
Federal Water Pollution Control Administration (to assist)
U. S. Geological Survey (furnish basic flow data and time of travel data for low flows)
Corps of Engineers (furnish time of travel data at peak flows)

h. Storage for Water Quality Management.

Federal Water Pollution Control Administration

Task No. 5 - Agricultural Studies

Agency Responsible:
Soil Conservation Service

Cooperating Agencies:
Economic Research Service
U. S. Forest Service
N.Y.S. Water Resources Commission (Conservation Dept.)

The investigations of task group 5 were under the general guidance of a United States Department of Agriculture Field Advisory Committee which was established for the Genesee River Basin to maintain continuous close field working relationships between the Agricultural agencies, develop procedures, assign priorities and schedules and prepare the Agricultural report.

Studies:

a. Inventory:

(1) Present water and land resources including such items as available land, land use, land conditions, cover conditions, availability of water, water quality, existing recreational facilities, and the physical and economic factors influencing the use of these resources.

(2) Present agricultural and urban floodwater, erosion and sediment damages in subwatersheds and on the main stem and major tributaries as requested.

(3) Water storage and water control opportunities in subwatersheds including physical data for each site as potential development for (1) flood prevention, (2) water supply, (3) water quality improvement, (4) agricultural water management, (5) recreation, and (6) fish and wildlife habitat improvement.

b. Determine all agricultural and nonagricultural needs and requirements for water and land use for upstream areas:

(1) Needs and requirements for water and land for urban, industrial, recreational, and other nonagricultural uses, based on estimated urban and industrial expansion. The Department will look to other agencies, who are specialists in those fields, for information pertaining to the survey. This will include:

(a) The estimated needs for municipal and industrial water supply and water quality control.

(b) The quantity and quality of groundwater supplies in the basin.

(c) The evaluation of the need for fish and wildlife habitat improvement.

(d) The magnitude of the demand for the development of recreational facilities in the basin.

(e) Other published or unpublished material pertinent to the development of the water and land resources of the basin.

(2) Agricultural and rural needs and requirements for water and land as related to demands for agricultural products taking into account projected advances in production and marketing technologies.

c. Evaluate program potentials for meeting needs and requirements:

(1) Evaluate and determine in relation to the demands for agricultural products the ability of the available land and water resources to meet production needs.

(2) Determine the needs of the Ontario Lake Plain area for irrigation water and the amount of water in excess of basin needs that could be diverted to the Lake Plain area.

(3) Determine the need for the acceleration of the installation of the land treatment needed on both forest and open lands as a means of improving the hydrology of the basin and contributing to the economic development.

(4) Based upon estimates and appraisals of needs, select the most feasible system of reservoirs, floodwater retarding structures, channel improvement, and other structures that will meet the rural and upstream needs by subwatersheds for water supply, water quality control, flood prevention, drainage, recreation, and fish and wildlife habitat improvement, as well as contribute toward meeting the main stem needs.

(5) Determine by use of acceptable short-cut methods and based upon estimates and projections, the cost and benefit of the structural features in the plan including allocation of costs to purpose.

d. Plan and report:

(1) Participate with the other agencies interested in the survey in the formulation of a comprehensive plan for the entire basin including the coordination of the upstream plan.

(2) Prepare a report of the Department's findings and recommendations.

Task No. 6 - Sedimentation

Agency Responsible:
U. S. Geological Survey

Cooperating Agencies:
N.Y.S. Water Resources Commission (Conservation Dept.)
Soil Conservation Service
U. S. Forest Service
Federal Water Pollution Control Administration
Corps of Engineers

a. Sampling, determination of sediment quantities at key localities, and identification of sources of sheet and streambank erosion.

U. S. Geological Survey (Work as outlined for Task Group No. 4)

b. Evaluate sheet and gulley erosion from detailed surveys of land use and geology, quantitative analysis of stream bank degradation and aggradation upstream of proposed storage sites and in other areas as time permits or as requested by other agencies, and determine remedial measures for the above.

Soil Conservation Service

c. Quantitative evaluation of stream bank erosion in selected areas on the main stem as coordinated with U. S. Geological Survey, and also determine remedial measures for the main stem.

Corps of Engineers

d. Effects on water quality (included in work of Task No. 4).

Federal Water Pollution Control Administration
N.Y.S. Health Department

e. Reservoir sedimentation studies for specific sites.

Soil Conservation Service (Upland sites)
Corps of Engineers (Main stem)
U. S. Geological Survey (As requested)

Task No. 7 - Power Studies

Agency Responsible:
Corps of Engineers

Cooperating Agencies:
Federal Power Commission
Soil Conservation Service
N.Y.S. Water Resources Commission (Conservation Dept.)
Interior Assistant Secretary for Water and Power

Studies:

Hydro-power studies

Federal Power Commission (determination of hydro potential, power requirements and power values)
Corps of Engineers (planning)
Interior Assistant Secretary for Water and Power (Determine power marketing criteria and rates)

Task No. 8 - Recreation Studies

Agency Responsible:
N.Y.S. Water Resources Commission (Conservation Dept.)

Cooperating Agencies:
Bureau of Outdoor Recreation
U. S. Fish and Wildlife Service
Soil Conservation Service
U. S. Forest Service
Economic Research Service
Corps of Engineers
Federal Power Commission
Pa. Department of Forests and Waters

Studies:

a. Inventory all existing and potential recreation areas around the basin and zone of influence.

b. Field reconnaissance of existing and potential recreation areas.

c. Determination of demand for recreation from within the Basin and the zone of influence.

d. Determination of present and future needs for areas and facilities.

e. Overall recommendations based on analysis of recreation needs and resources of the basin.

f. Evaluate the recreational benefits to be expected from those improvements selected for detailed study.

Task No. 9 - Fish and Wildlife Studies

Agency Responsible:
U. S. Fish and Wildlife Service

Cooperating Agencies:
N.Y.S. Water Resources Commission (Conservation Dept.)
Pa. Fish and Game Commission
Soil Conservation Service
Corps of Engineers

Studies:

a. Fish and Wildlife management studies with and without proposed developments for other purposes.

U. S. Fish and Wildlife Service
N.Y.S. Water Resources Commission (Conservation Dept.) assisting.
Pa. Fish and Game Commission - assisting.

b. Develop plan for water-related fish and wildlife resources to best meet present and future needs.

U. S. Fish and Wildlife Service
N.Y.S. Water Resources Commission (Conservation Dept.)
Pa. Fish and Game Commission

c. Evaluate benefits or damages to fish and wildlife resources to be expected from considered improvements.

U. S. Fish and Wildlife Service

Task No. 10 - Water Requirements

Agency Responsible:
Corps of Engineers

Cooperating Agencies:
All

Studies:

This task consists of compiling basic material developed in conjunction with task nos. 3-9, on both existing and projected water resource needs.

a. Flood Damage
Task Group No. 3

b. Water Supply
Task Group No. 4

c. Water Quality Management
Task Group No. 4

d. Soil Conservation and Land Management
Task Group No. 5

e. Irrigation and Rural Water Use
Task Group No. 5

f. Sedimentation
Task Group No. 6

g. Power
Task Group No. 7

h. Recreation
Task Group No. 8

i. Fish and Wildlife
Task Group No. 9

Task No. 11 - Preliminary and Final Site Screening

Agency Responsible:
Corps of Engineers

Cooperating Agencies:
All

Studies:

a. Examination of possible reservoir sites by map studies and field reconnaissance.

All Agencies (suggested sites)
Corps of Engineers (main stem & major sites on tributaries)
Soil Conservation Service (sub-watershed sites)

b. Foundation exploration and additional surveys at seected sites.

Corps of Engineers (main stem & major sites on tributaries)
Soil Conservation Service (sub-watershed sites)

c. Develop preliminary and detailed estimates of benefits and where appropriate cost for inclusion of specific purposes at potential reservoir sites:

1. Flood Control
Task Group No. 3

2. Municipal and industrial water supply
Task Group No. 4

3. Water Quality Control
Task Group No. 4

4. Irrigation, rural, domestic and livestock water supply
Task Group No. 5

5. Erosion Control
Task Group No. 6

6. Power
Task Group No. 7

7. Recreation
Task Group No. 8

8. Fish and Wildlife
Task Group No. 9

d. Evaluation of alternative methods of meeting basin needs.

(Appropriate task groups as previously assigned)

e. Feasibility studies of alternative reservoir projects and combinations (including sub-watershed projects developed by the Soil Conservation Service) resulting in final selection of sites for detailed study.

Corps of Engineers
Soil Conservation Service

f. Integrated, coordinated studies of upstream projects developed by Soil Conservation Service and those proposed downstream, cost-benefit analysis of various alternative schemes (basic data from developing agency).

Corps of Engineers (downstream effects)

Task No. 12- Project Formulation and Basin Plan Formulation

Agency Responsible:
Corps of Engineers

Cooperating Agencies:
All

Studies:

a. Project formulation of major sites. (Recommendations for projects requiring construction starts in the ensuing 10 to 15 years).

Corps of Engineers
Soil Conservation Service (subwatersheds)

b. Basin plan formulation.

Corps of Engineers (Preparation of report to be submitted to States and Congress. Draft of report will be reviewed by all concerned before formal submission).

Task No. 13 - Public Information

Agency Responsible:
New York State Water Resources Commission (Dept. of Commerce)

Cooperating Agencies:
All

a. The prime purpose of this task is to promote public awareness of the reason for and the objectives of the Genesee River Basin Comprehensive Study, through whatever media are adopted as being consistent with the best interests of the study.

b. Where practicable, keep the public informed of current study progress.

36. In accordance with the task group procedures, paragraph 34, several task groups were responsible for the preparation of appendices for the final basin report. Table A3 shows the appendices for which a given task group was responsible.

TABLE A3 - Appendices prepared by Task Groups

Appendix Number	Appendix Title	Task Group #
B	Plan Formulation	10, 11 & 12
C	Project Designs & Cost Estimates	11
D	Economic Base Study	1
E	Hydrology	3
F	Flood Control	3
H	Water Supply & Water Quality Management	4
I	Groundwater Resources	4
J	Agricultural Studies	5
K	Sedimentation	6
L	Hydroelectric Power	7
M	Outdoor Recreation	8
N	Fish and Wildlife	9

TASK GROUP ACTIVITY DATES

MEETINGS (GROUP AND SUBGROUP) & DISTRIBUTION OF PRELIMINARY DRAFT OF APPENDICES

TASK GROUP	TITLE	RESPONSIBLE FOR APPENDIX	YEAR	JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPT.	OCT.	NOV.	DEC.
NO. 1	ECONOMIC BASE STUDY	"D"-ECONOMIC BASE	63	30					20				29[1] 31		
			64	8[2]		18		19 26[3]			1[4]	15	16[5] 27		1, 9 & 14
			65		24		14[6]	18	24		12[7]		19		7
			66	27	14		12 (APP. "D"-PARTS I, II & III)		8[8]						
			67			14 (APP. "D"-PART IV)									
NO. 3	HYDROLOGIC & HYDRAULIC STUDIES	"E"-HYDROLOGY	64								26				
			65	13								29			
		"F"-FLOOD CONTROL	66										6 (APP. "E & F")		
NO. 4	GROUND WATER AND QUALITY OF WATER STUDIES	"H"-WATER SUPPLY & WATER QUALITY MANAGEMENT	63									10	14		
			64			10		28					23	30	
			65				28				30		23	21	
			66						20		27			15 (APP. "I")	
		"I"-GROUND WATER	67		9 (APP. "H")				8 (APP. "I" & "H" PHOTO READY)						
NO. 5	AGRICULTURAL STUDIES	"J"-AGRICULTURAL STUDIES	63										16		
			64		19							15-16			
			65	14		18-19						23-24			
			66	5	15		21-22		16-17					8 (APP.-"J")	
			67					26 (APP. "J" PHOTO READY)							
NO. 6	SEDIMENTATION	"K"-SEDIMENTATION	63												
			64											23	
			65	26									21		
			66										4 (APP. "K")		
			67				7 (APP. "K" PHOTO READY)								
NO. 7	POWER STUDIES	"L"-ELECTRIC POWER	64						26	9 (CORPS ACCEPTED CHAIR)					
			65									23			
			66				27		8			8			
			67	19 (APP. "L")											
NO. 8	RECREATION STUDIES	"M"-OUTDOOR RECREATION	64				20		24[9]			(N.Y.S. ASSIGNED CHAIR)		18	21
			65		3			12 & 20	29	27-28	31	1	27	18	
			66				20								
			67			30		29 (APP. "M")	5				5		
NO. 9	FISH & WILDLIFE STUDIES	"N"-FISH & WILDLIFE	64												
			65	13					22			21			
			66				21								
			67		17 (APP. "N")										
NO. 12	PLAN FORMULATION	"B"-PLAN FORMULATION	66											29	
			67	10-11	28								4 (APP. "B" ADVANCE COPY)		
			68	24 (APP. "B")											
NO. 13	PUBLIC INFORMATION		64									28			
			65									30 (BROCHURE)			
			66												

(1) DELINEATION OF GENESEE RIVER BASIN ECONOMIC AREAS AND SUBAREAS, PHASE I
(2) PARTIAL INVENTORY OF REGIONAL RESOURCES, PHASE I
(3) STATEMENT OF METHODOLOGY FOR GENESEE RIVER BASIN ECONOMIC STUDY
(4) PRELIMINARY REPORT ON MAJOR DEMOGRAPHIC AND ECONOMIC CHANGES, PHASE I
(5) PHASE I COMPLETED
(6) DRAFT, "AGRICULTURAL ECONOMY AND PROJECTED EMPLOYMENT AND PRODUCTION IN FOREST INDUSTRIES"
(7) POPULATION AND EMPLOYMENT PROJECTIONS, PHASE II
(8) FINAL (PHOTO READY) "AGRICULTURAL ECONOMY AND PROJECTED EMPLOYMENT AND PRODUCTION IN FOREST INDUSTRIES"
(9) B.O.R'S. INVENTORY OF EXISTING RECREATION AREAS

FIGURE A4

FIGURE A4

37. The Task Group Activity chart, figure A4, shows the dates major task group meetings or subcommittee meetings were held by the task groups detailed in paragraph 34.

38. FINAL REPORT

The final report is a cooperative venture by the several Federal and State agencies having an interest in the many different purposes. The report originally had the two major objectives as follows:

a. Identify the most feasible overall plan, and most feasible alternative plan or plans, which have considered all current and projected water resource needs and demands through the year 2020, but due to restraints of personnel, time and funds alternative plans will not be presented.

b. The most urgent or short range water needs, those Federal or Federally assisted projects for which Federal authorization will be required to permit necessary construction to be initiated in the next 10 to 15 years are presented in sufficient detail so that participating agencies can use the report with minor revisions as their agency's authorization report.

39. The Corps of Engineers, as the chairman agency, was assigned the responsibility of preparing the main report and all appendices not assigned to a Task Group as shown in table A3, except appendix "G" - Water Laws, which was prepared by the State of New York and the Commonwealth of Pennsylvania. The Corps of Engineers, under the direction of the Coordinating Committee, also, will have the responsibility of printing and distributing the main report and all appendices regardless of the Task Group that prepared the appendix.

40. The final basin report will be divided into several volumes of reasonable size in accordance with the ISC, Guidelines of 10 June 1965. The main report and fourteen appendices will be printed and bound in seven volumes as shown in table A4.

TABLE A4 - Basin report by volumes

Volume	Appendix	Title
I	-	Main Report
II	A	History
	B	Plan Formulation
	C	Project Designs & Cost Estimates
III	D	Economic Base Study
IV	E	Hydrology
	F	Flood Control
V	G	Water Laws
	H	Water Supply and Water Quality Management
	I	Groundwater Resources
VI	J	Agricultural Studies
	K	Sedimentation
VII	L	Hydroelectric Power
	M	Outdoor Recreation
	N	Fish and Wildlife

41. COST OF STUDY

One of the first duties of the Corps of Engineers, as the chairman agency of the Coordinating Committee, was the preparation of a coordinated budget for the study. The first cost estimate was furnished 29 March 1962. The cost estimates were revised several times as the results of meetings with the several other agencies involved in the study and policy re-evaluation as to the degree of participation by other agencies in the study.

42. The Office, Chief of Engineers, in the first quarter of fiscal year 1964 had a review team go into the field to revise the cost estimates for all comprehensive studies in accordance with the request of Senator Allen J. Ellender as cited in paragraph 47. The review team, headed by Brigadier General Howard W. Penney requested major changes in the cost estimates for the Genesee River study during their review of proposed costs of work requirements by the several agencies on 26 July 1963.

GENESEE RIVER BASIN COMPREHENSIVE STUDY

PROGRAM COST

TOTAL COST $1,125

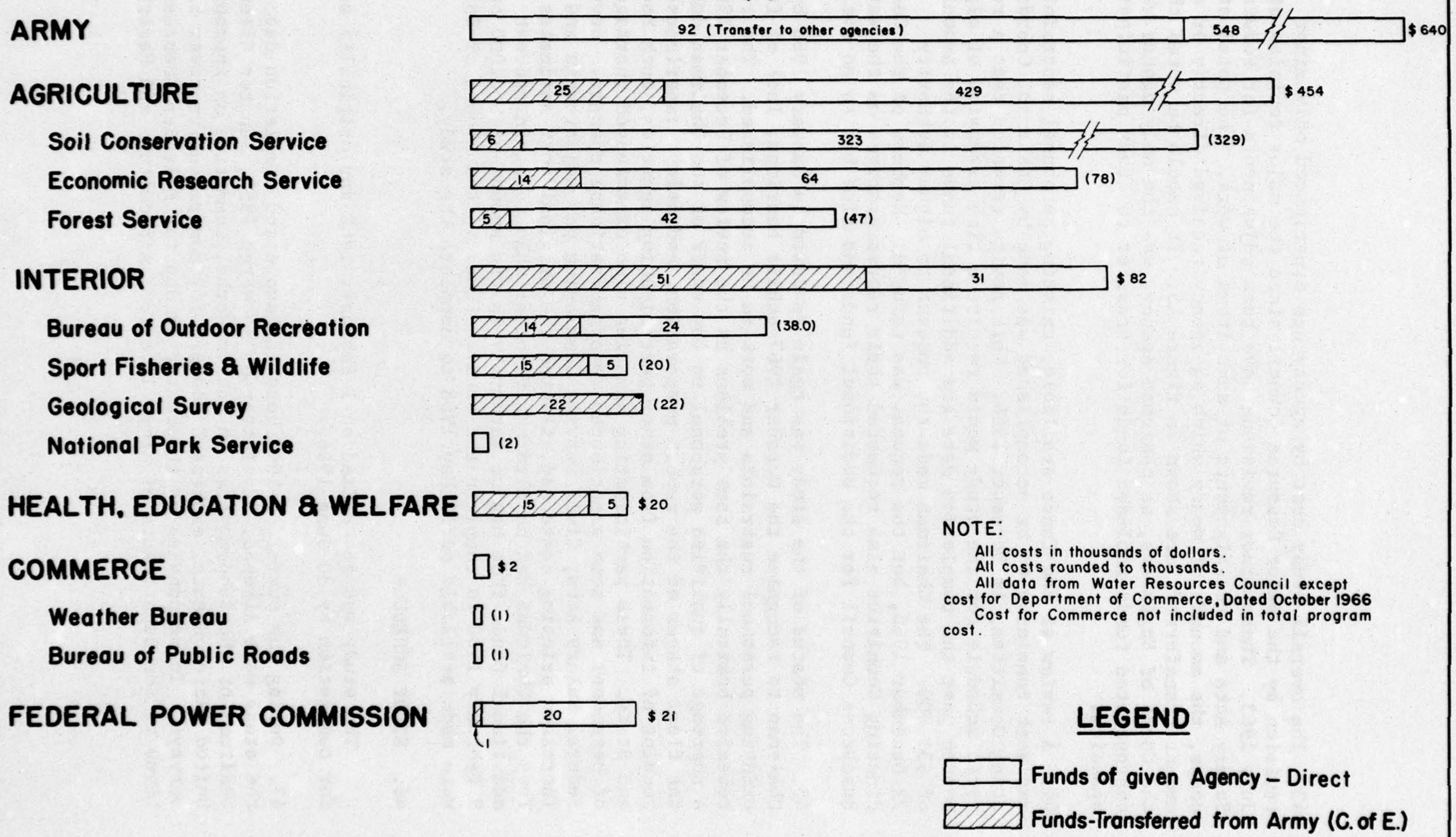


FIGURE A5

FIGURE A5

43. The overall study cost by agency has experienced only minor revision by the Water Resource Council since the major revision of July 1963. These minor revisions have been adjustments for Federal Salary Acts and reassignments of some items of work. The total study costs, the amounts of money which an agency received directly or an amount transferred, are shown in figure A5. It should be noted that the Corps of Engineers, as chairman agency, was the only agency whose appropriated funds included funds for transfer to other participating agencies.

44. A review of the funds available, existing personnel restraints and work remaining to be accomplished was made by Chairman, Coordinating Committee, in December 1966. This review revealed that a realistic schedule for the study would require a time extension of eight months past the completion date and additional funds in the amount of $31,000. The Chairman made the request to higher authority 22 December 1966, but the request was refused. Members of the Coordinating Committee also requested their representatives on the Water Resources Council for the additional funds and time but to no avail.

45. The status of the study was again reviewed in January 1968 by the Chairman to recognize the October 1967 public hearings, lack of funds, existing personnel restraints and work to be accomplished. The review revealed basically the same problems as the review of December 1966: A shortage of qualified personnel on the staff of the Chairman during the final stages of the report preparation, and delays experienced in receipt of information from other participating agencies, both Federal and State. These participating agencies also experienced shortages of personnel and some experienced re-organizational changes. Several Federal Salary Acts, Civil Service Commission pay adjustments and increased printing costs had affected the original cost estimates. Thus the Chairman had no alternative other than to again request additional funds from higher authority in the amount of $68,000 on 9 February 1968 to complete the study. Funds in the amount of $55,000 were made available on 13 May 1968 to complete the study.

46. STUDY SCHEDULE

The study was authorized on 1 February 1962 and originally scheduled for completion by 30 June 1966.

47. During the summer of 1963 both the scope and completion date of the study were altered. By letter of 15 March 1963, Senator Ellender, Chairman of the Subcommittee on Public Works, Committee on Appropriations, United States Senate, expressed concern for comprehensive river basin surveys. In responding to the letter of Senator Ellender, representatives of the Departments of Army, Interior, Agriculture and Health,

Education and Welfare, joined with the Bureau of the Budget in establishing new guidelines for comprehensive basin planning. These new guidelines were followed. Thus budget and appropriation cuts extended the study completion date to 30 June 1967.

48. The study was running approximately six months behind schedule due to personnel shortages and other problems cited in paragraph 45. The Chairman, Coordinating Committee, requested a time extension in December 1966 of eight months, making the completion date February 1968. The request was disapproved.

49. The schedule date, 30 June 1967, was not met. The study continued with limited available personnel and remaining funds. On 9 February 1968 the Chairman, Coordinating Committee, advised higher Authority that additional funds in the amount of $68,000 and a period of six months after receipt of funds would be required to complete and publish the report. In view of receipt of additional funds in May 1968, the study should be completed by December 1968.

50. COORDINATING COMMITTEE MEETINGS

After the Secretary of Army invited the Secretaries of several Federal Departments involved in the study to designate representatives for the Coordinating Committee, the District Engineer, Buffalo, scheduled the first meeting in Buffalo on 24 April 1963.

51. The first meeting was a two-day meeting with the first day, 24 April 1963, basically an orientational and organizational meeting in the District office. The agenda for this meeting is shown as exhibit A16. The second day, 25 April 1963, was devoted to an approximate three hundred mile tour of the basin to acquaint the members of the Coordinating Committee with the basin.

52. Figure A6 shows those members and alternate members of the Coordinating Committee in attendance at the first meeting. The figure also shows the attendance at all meetings. It should be noted that at some meetings, a person other than the member or alternate is shown representing a given agency. The person denoted was officially designated to represent the given agency for that meeting.

53. The second meeting, 18 June 1963, was held in the City Council Chambers, City Hall, Rochester, New York. This was one of two meetings held outside of the Buffalo District office. The main items of business were: the acceptance by the Coordinating Committee of the specifications for the Economic Base Study for the purpose of negotiating with New York State; acceptance of the Plan of Survey as a flexible study outline

COORDINATING COMMITTEE MEETINGS
(ATTENDANCE MEMBERS AND ALTERNATE MEMBERS)

1 JAN. '63 | 1 JULY '63 | 1 JAN. '64 | 1 JULY '64 | 1 JAN. '65 | 1 JULY '65 | 1 JAN. '66 | 1 JULY '66 | 1 JAN. '67 | 1 JULY '67 | 1 JAN. '68 | 1 JULY '68 | 1 JAN. '69 | 1 JULY '69

1ST MEETING AT BUFFALO, NEW YORK 24 APRIL 1963

COL. L.J. HAMERLY-C of E
M. ABELSON - INTERIOR
I.B. STAFFORD - AGRIC.
R.D. PERRY - AGRIC.
G.E. KIRK - COMMERCE
J.M. WILLIAMS - COMMERCE
C.R. OWNBEY - HEW
D.J. WAIT - FPC
H.G. WILM - N.Y.
A.J. SOMMERVILLE - PA.

2ND MEETING AT ROCHESTER, NEW YORK 18 JUNE 1963

COL. L.J. HAMERLY-C of E
M. ABELSON - INTERIOR
I.B. STAFFORD - AGRIC.
R.D. PERRY - AGRIC.
G.E. KIRK - COMMERCE
J.M. WILLIAMS - COMMERCE
C.R. OWNBEY - HEW
K.W. ROSS - FPC*
F.W. MONTANARI - N.Y.

3RD MEETING AT BUFFALO, NEW YORK 20 FEBRUARY 1964

COL. L.J. HAMERLY-C of E
J.E. HARPER - INTERIOR*
R.D. PERRY - AGRIC.
G.E. KIRK - COMMERCE
J.M. WILLIAMS - COMMERCE
C.R. OWNBEY - HEW
D.J. WAIT - FPC
F.W. MONTANARI - N.Y.

4TH MEETING AT BUFFALO, NEW YORK 8 OCTOBER 1964

COL. R.W. NEFF - C of E
MAJ. J.M. NEIL - C of E
M. ABELSON - INTERIOR
W.L. ANDERSON - AGRIC.
R.D. PERRY - AGRIC.
J.M. WILLIAMS - COMMERCE
W.Q. KEHR - HEW
L.B. WOLL - FPC*
F.W. MONTANARI - N.Y.

5TH MEETING AT BUFFALO, NEW YORK 13-14 OCTOBER 1965

COL. R.W. NEFF - C of E
M. ABELSON - INTERIOR
W.L. ANDERSON - AGRIC.
R.D. PERRY - AGRIC.
J.M. WILLIAMS - COMMERCE
W.Q. KEHR - HEW
L.B. WOLL - FPC*
N.L. BARBAROSSA - N.Y.

6TH MEETING AT LETCHWORTH STATE PARK 21-21 JUNE 1966

COL. R.W. NEFF - C of E
M. ABELSON - INTERIOR
W.L. ANDERSON - AGRIC.
R.A. HOGUE - AGRIC.
G.E. KIRK - COMMERCE
J.M. WILLIAMS - COMMERCE
L.E. TOWNSEND - HEW*
A.M. MONACO - FPC*
F.W. MONTANARI - N.Y.

7TH MEETING AT BUFFALO, NEW YORK 15 MARCH 1967

COL. R.W. NEFF - C of E
MAJ. L.E. LUFKIN - C of E
M. ABELSON - INTERIOR
W.L. ANDERSON - AGRIC.
J.M. WILLIAMS - COMMERCE
R. VanDERWERKER - HEW*
J. SPELLMAN - FPC
F.W. MONTANARI - N.Y.
N.L. BARBAROSSA - N.Y.

8TH MEETING AT BUFFALO, NEW YORK 13 OCTOBER 1967

COL. A.L. WRIGHT - C of E
M. ABELSON - INTERIOR
W.L. ANDERSON - AGRIC.
R.A. HOGUE - AGRIC.
G.E. KIRK - COMMERCE
J.M. WILLIAMS - COMMERCE
R.J. VanDERWERKER - HEW
J.H. SPELLMAN - FPC
F.W. MONTANARI - N.Y.
N.L. BARBAROSSA - N.Y.
N.G. KAPKO - PA.*

9TH MEETING AT BUFFALO, NEW YORK 30-31 JULY 1968

COL. A.L. WRIGHT - C of E
MAJ. B.R. SCHLAPAK-C of E
M. ABELSON - INTERIOR
W.L. ANDERSON - AGRIC.
R.A. HOGUE - AGRIC.
R. MASHBURN - AGRIC.*
J.M. WILLIAMS - COMMERCE
R. VanDERWERKER - HEW*
J. SPELLMAN - FPC
F.W. MONTANARI - N.Y.
N.L. BARBAROSSA - N.Y.
M. GOULDING - PENN.*

10TH MEETING AT BUFFALO, NEW YORK 10-11 JUNE 1969

COL. A.L. WRIGHT - C of E
M. ABELSON - INTERIOR
W.L. ANDERSON - AGRIC.
J.M. WILLIAMS - COMMERCE
R.J. VanDERWERKER - HEW
J.H. SPELLMAN - FPC
F.W. MONTANARI - N.Y.
A.J. SOMMERVILLE - PENN.
L.T. CROOK - GL.B.C **

* ACTING MEMBER FOR INDICATED MEETING
** OBSERVER

FIGURE A6

FIGURE A6

and to be updated periodically; selection of Angelica Creek basin as sample area for preliminary study, where appropriate, by participating agencies; and establishing procedures for the initial public hearings. The agenda for this meeting appears as exhibit A17.

54. The third meeting, a one-day meeting, on 20 February 1964 was held in Buffalo District office. The day was devoted principally to presentation of status reports. A revised Plan of Survey, emphasizing listing of agency responsibilities and work schedules in Pert and CPM diagrams, was distributed and discussed with further review and comment requested.

55. Subsequent to the second meeting of the Coordinating Committee, both the scope and completion date of the study were altered. In responding to a query by Senator Ellender, representatives of the Departments of Army, Interior, Agriculture and Health, Education and Welfare joined with the Bureau of the Budget in establishing new guidelines for comprehensive basin planning. These new guidelines are to be followed. Budget and appropriation cuts extended the study completion date into fiscal year 1967.

56. An additional task group was created with mission of public information, to be headed by New York State with all other agencies cooperating. The agenda for this meeting appears as exhibit A18.

57. The fourth meeting of the Coordinating Committee was also a one-day meeting in the Buffalo District office. Departmental progress reports were made by each Committee member followed by similar task group reports by the responsible agency representative. Agenda for this meeting appears as exhibit A19. The revised Plan of Survey, distributed several weeks prior to this meeting, was brought up for discussion. It was agreed that this plan of survey had reached a degree of refinement so that it reflected a consolidated version which could be mutually agreed upon by all. This latest Plan of Survey included: Task Group Procedures, Final Report Outline and Detailed Task Group Work Outlines.

58. The background and Corps proposal to alleviate the flood problem on Red Creek was summarized. Benefits for this project are derived primarily from flood prevention and land enhancement. The "Interim Report for Red Creek" and others which may emerge from this study are to receive review and comments of the Committee.

59. The fifth meeting, a two-day meeting, was held in the Buffalo District office. The first day, 13 October 1965, was devoted to statements and remarks by the Coordinating Committee members and to

progress reports from the various task groups. Questions and comments were heard after each report. A decision was made that orientation sessions for instructing various agencies on the use of the economic base study would be beneficial.

60. On the second day, 14 October 1965, the Corps of Engineers work under the "Appalachian Regional Development Act of 1965" was presented. Three Corps of Engineers flood protection projects in the Genesee basin were discussed: Red Creek, Wellsville and Warsaw. It was reported by New York State that the *Compendium of State water* laws and policies was expected for release by 1 March 1966. No information of Pennsylvania's water laws was available at this meeting. The final basin report format was discussed and it was stated that the Guidelines prepared for a Type I (Framework Study) should be of assistance. The "Interim Report on Red Creek" is an example of typical format used by the Corps. The concluding subject for discussion at this meeting was the presentation of proposed improvements for local flood protection at Canaseraga Creek. Agenda for this meeting appears as exhibit A20.

61. The sixth meeting, a two-day meeting, 21 and 22 June 1966 was held at Letchworth State Park, Castile, New York. This was the second of two meetings held outside the Buffalo District office. A Public Information Meeting was held on the evening of 21 June 1966 at Mount Morris Central School, Mount Morris, New York, in conjunction with this committee meeting. The Coordinating Committee meeting on 21 June 1966 convened at approximately 1:00 p.m. The main order of business consisted of remarks and comments by Coordinating Committee members and task group progress reports. The proposed opening statement by the Chairman of the Coordinating Committee to the public information meeting was distributed to members for review and comment.

62. The meeting on the second day convened at 9:00 a.m. with an open discussion period for questions or comments by members on previous session and/or public information meeting. The mechanics of producing, distributing and reviewing the various Appendices as well as incorporating the review comments in final draft were discussed. A schedule of proposed submission dates of Appendices was determined. It was decided that after completion of initial drafts of the Appendices, a meeting should be arranged for Task Group No. 12, to formulate a basin plan with alternatives. The agenda for this meeting appears as exhibit A21.

63. The seventh meeting, a one-day meeting, on 15 March 1967 was held in the Buffalo District office. The agenda for this meeting appears as exhibit A22. The primary purpose of this meeting was to

discuss accelerating the program schedule. The study's scheduled completion date of 30 June 1967, must be met per directive of the Water Resources Council. All Type II Comprehensive Studies must meet their respective scheduled completion dates. The four uncompleted Appendices and main report were given deadlines for submittal prior to the end of April. Review was limited to thirty days so that comments could be received by or, prior to the end of May.

64. The suggestion by H.E.W. concerning deletion of the word "Comprehensive" in the study was discussed at this meeting. All members agreed that all the Appendices were comprehensive except Plan Formulation, Appendix "B". Due to time and personnel limitations Appendix "B" must be considerably less than the true word "comprehensive."

65. Modification of this study to apply Appalachia Criteria to that portion of the basin within the Appalachian region was also discussed. All members present, with the exception of the member from the State of New York agreed that the study should be completed according to the original parameters and then apply Appalachia Criteria to the Appalachian portion of the basin. The New York State member felt Appalachia Criteria should be applied in the initial study. He did recognize that the remaining time till scheduled completion date did preclude doing so.

66. A summary of plan formulation objectives was given by the Corps. Three meetings of Task Group 12 (Plan Formulation) had been held with good attendance by all agencies. The first meeting on 29 November 1966 was attended by 23 persons representing 14 agencies in the study. The second meeting on 10-11 January 1967 was attended by 26 persons from 14 agencies. The third and final meeting on 28 February 1967 was attended by 21 persons for 10 agencies. In the plan formulation process Task Group 12 decided that the Corps should consider Portage Reservoir and Stannard Reservoir individually and in combination to meet the identified needs of the basin. The Department of Agriculture was assigned the task of considering the upland reservoir sites to meet the identified needs of the basin as well as to consider meeting these needs with upland reservoirs in conjunction with Portage and Stannard. Plan formulation by the Corps on Portage reservoir was very well along. Four plans for Portage reservoir were considered with one plan of these plans considered feasible. A flood protection plan by the Corps for Canaseraga Creek required Agricultural and Fish and Wildlife benefits to determine how far to go with structural possibilities. The Department of Agriculture, Soil Conservation Service had identified 48 upland sites to meet the needs of the next 10-15 years. These sites meet irrigation, recreation, low-flow augmentation, water supply and fish and wildlife needs. S.C.S. was waiting for planning

aid letter from F & WL to firm up selection of sites made as a result of a meeting with them. The Department of Agriculture cannot build any of these upland sites under PL 566 for any purpose other than irrigation.

67. A definite need was recognized for informing the public about this study. It was thought that a summary report, put out in great numbers would be beneficial. A suggestion was made that prior to the public hearing it would be appropriate to have meetings with groups such as the County Boards of Supervisors, to orient these people on what has been done in the study. A date for a public hearing was discussed with 19 July 1967 mentioned as earliest date possible. No agreement was reached on a suitable date and decision was deferred.

68. The eighth meeting of the Genesee River Basin Coordinating Committee was held in the Buffalo District office on 13 October 1967. The agenda for this meeting appears as exhibit A23. The primary purposes of this meeting were to review the basin plan as formulated by Task Group 12 and the proposed agenda for the public hearing. (The public hearings were held on the 25th and 26th of October 1967 at Mount Morris, New York, and Rochester, New York respectively.) The basic plan presented essentially the combination of all the proposed plans that were submitted by the various Task Groups in Appendices C, F, H, J, L, M & N. These Appendices also include all the identified needs in the basin. Plates B-2 and B-3, from Appendix B - Plan Formulation, illustrate the plans and needs in the basin. Plate B-1 delineates the economic subareas and the areas used for other study purposes. Oversize enlargements (4' x 8') of these three plates, to be used at the public hearing were utilized in review of the basin plan at this meeting. The individual projects of the Corps and the Soil Conservation Service were discussed in detail. After presentation of the Basin Plan, comments were requested on the advance copy of Appendix B - Plan Formulation. The main comment of the members of the Coordinating Committee was again, that the study could no longer be considered "Comprehensive." More than one member felt that all reference or use of the word in the study should be deleted. As a direct result of this discussion it was decided that the word "Comprehensive" would not appear on the cover of the final draft of the Appendices nor on the cover of the main report. However, no changes would be made in text of the Appendices but a suitable comment would be inserted in Appendix B and in the main report to the effect that the Coordinating Committee does not consider this proposed Basin Plan a truly comprehensive plan in the sense that all reasonable alternatives were investigated. An additional comment was made to the effect that although Task Group 4 concluded that Rochester Metropolitan area's

water supply would come from Lake Ontario, there are indications from studies by a consultant for the State of New York that water supply could possibly be met by upland storage more economically. The Committee member for the Public Health Service pointed out that the "Public Health aspects of Water Resources development planning has been broadened." This study has not taken into account these changes. The Public Health Service has been assigned responsibility in the following areas of concern, namely:

(1) Vector control aspects;

(2) Epidemiology of water born diseases; and

(3) Sanitary survey of water and related land resources

Therefore, the Public Health Service will be consulted in the above areas of concern during advance engineering and design phase of any of the projects in the proposed Basin Plan, if authorized for construction by Congress.

69. The proposed agenda for the Public Hearings was approved with only the following minor modifications. To reduce time required to present the Basin Plan, only the Chairman of the Coordinating Committee and the member from the State of New York would make opening statements. The Chairman would then introduce the Coordinating Committee members and their staff and the member from the State of New York would then introduce his staff. The presentation of the Basin plan would be made by representatives of the State of New York, Corps of Engineers and the Soil Conservation Service, in that order. The members of the Committee present would be available for questions from the floor during the question and answer period.

70. The ninth meeting, a two day meeting was held 30 and 31 July 1968 in the Buffalo District office. The agenda for this meeting appears as exhibit A24. The primary purpose of this meeting was to review the status of the Genesee River Study, in light of the October 1967 public hearings, the depletion of study funds in January and receipt of additional funds in May of $55,000.

71. A discussion was conducted of the comments on the Sabine River, Type II study, from the recent Water Resources Council actions, it was concluded that the comments could be used as a guide when writing the Genesee report. A condensed version of OCE views on summary reports and agency authorization reports were distributed and discussed. New York State presented the results of the Harza Engineering report and the State Appendix. A discussion on the publishing of the final report and number of copies required, resulted in the request that the Corps of

Engineers print five hundred copies of each appendix and six hundred copies of the "Summary Report."

72. The October 1967 Public Hearings were discussed, and the consensus of opinion was that justification for the Portage project existed, regardless of the objections presented at the Public Hearings.

73. The short range and long range Basin plans were generally accepted by all members with the exception of the Portage Reservoir which was generally felt should be handled as a separate entity, and the Standard Reservoir which should be considered part of Appalachia but referred to in the Genesee report.

74. The tenth meeting, a two day meeting was held 10 and 11 June 1969 in the Buffalo District office. The objectives of the meeting were to review all comments from members of the Coordinating Committee and their staffs concerning the draft of the "Summary Report" and to come to agreement on final changes to facilitate final publication as soon as possible. The agenda for this meeting appears as exhibit A25.

75. Each comment received was discussed and an acceptable revision proposed. It was the consensus of the members of the Coordinating Committee that an "Addition" should be included in the "Summary Report." This "Addition" would act to alert those agencies that might make later studies within the basin of the areas of change in the data presented in the "Summary Report" and appendices. The "Addition" is to briefly discuss change conditions and/or criteria which would necessitate major revisions in the report for which there are personnel and funding restraints. The major items would include Stannard Reservoir under the Appalachia Study, water quality and revised interest rates.

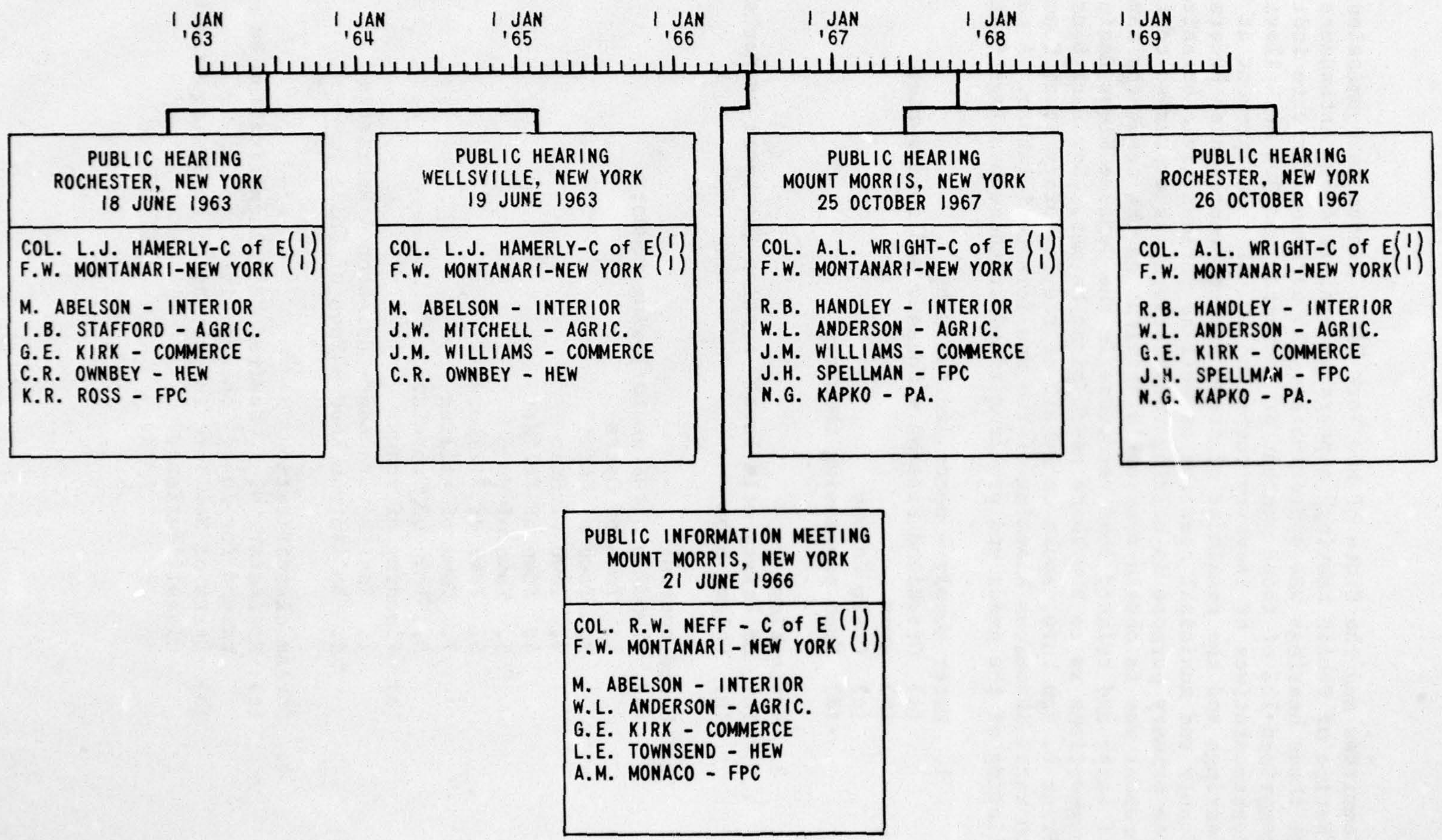
76. The revisions to the "Summary Report" and the preparation of the "Addition" are to be made by Corps of Engineers personnel. These changes will be distributed to members of the Coordinating Committee for their comments prior to the final publishing of the "Summary Report." It is anticipated that no additional meetings of the Coordinating Committee will be convened unless further comments by the Water Resources Council warrant.

77. SUMMARY OF PUBLIC HEARINGS AND INFORMATION MEETINGS

Four public hearings and one information meeting were held in conjunction with the study. Figure A7 shows those members of the Coordinating Committee in attendance at each hearing or meeting. The first two, held on the 18th and 19th of June 1963 in Rochester and Wellsville, New York, respectively were Public Hearings. They were joint hearings conducted by the Genesee River Basin Coordinating

PUBLIC HEARINGS AND INFORMATION MEETING

COORDINATING COMMITTEE REPRESENTATION



(1) CO - CHAIRMEN

FIGURE A7

FIGURE A7

Committee and the State of New York Water Resources Commission. The "Notice of Public Hearing" appears as exhibit A26. Attendance at each of these hearings was approximately 125 persons. Private individuals comprised 10% of those present at Rochester and 30% at Wellsville. Representatives of industry comprised 10% of those present at both hearings and the remainder of those present represented Federal, State, County and municipal agencies as well as various civic organizations. The primary purpose in holding the hearings, as expressed to those present was to obtain everyone's opinions on the needs for development of water and related land resources in the Genesee River Basin and suggestions as to how these needs might be met. New York Senator Frank E. Van Lare, spoke on behalf of the Temporary State Commission on Water Resources Planning of the New York Legislature. A partial listing of the needs and problems cited at these hearings follows:

1. Water supply - needs indicated by;
   (a) Groveland Station - Conesus and Springwater
   (b) Avon
   (c) Craig Colony
   (d) Food processing industry

2. Irrigation
   (a) On "sixty mile level" section (Lockport to Rochester)
   (b) Upland area

3. Flood control
   (a) Flooding cited at following towns;
       1. Town of Gates
       2. Town of Chili
       3. Town of Scio
       4. Town of Belfast
       5. Town of Hume
       6. Town of Fillmore
       7. Town of Willing
       8. Town of Groveland
   (b) Flooding of roads
       1. East River Road - Brighton & Henrietta
       2. Ballantyne Road - Town of Chili

4. Stream classification
   (a) Rochester, N. Y. desired "B" classification be maintained for lower Genesee River.
   (b) State of New York in process of reviewing existing stream classifications.

5. Bank erosion areas
   (a) Allegany County
   (b) Belfast
   (c) Caneadea
   (d) Fillmore
   (e) Hume

6. Land conservation measures
   (a) Reforestation, farm ponds and conservation farming on upland areas to reduce erosion and sedimentation.

7. Low flow augmentation
   (a) Rochester Area - to dilute industrial discharges to river in dry season.
   (b) Streams traversed by the Barge Canal.

8. Recreation

78. On the evening of 21 June 1966 a Public Information meeting was held by the Genesee River Basin Coordinating Committee, in Mount Morris Central School auditorium, Mount Morris, New York. The "Notice of Public Information Meeting" appears as exhibit A27. The sixth Coordinating Committee meeting was held at the Administration Building of Letchworth State Park on the afternoon of the same day. The purpose of this information meeting was to present to the people of the basin the current study progress, show the ultimate goals and objectives of the study and provide an opportunity for the members of the audience to ask questions. Attendance at this meeting was approximately 200 persons. Private individuals comprised nearly 30% of those present. Representatives of industry comprised 10% and the remainder of those present represented Federal, State, County and municipal agencies as well as various civic organizations.

79. In his opening remarks the Chairman of the Coordinating Committee, Colonel R. Wilson Neff, stated the general aims and purposes of the study and outlined the origin of the study authorization by Congress. The organization which was formed to implement the many tasks connected with the study was also discussed briefly.

80. Each Coordinating Committee member present made a statement for his agency covering the area of his Agency's interest and extent of involvement in the study. Where the agency was Chairman of a task group or groups his statement also included an explanation of the task group's activities. The following members, in order of their appearance made a statement and report of a task group as indicated:

Mr. Mark Abelson - Regional Coordinator, U. S. Department of the Interior
   (a) Task Group #6 - Sedimentation
   (b) Task Group #9 - Fish and wildlife resources

Mr. Wallace Anderson - State Conservationist, U. S. Department of Agriculture

Mr. George Kirk, U. S. Bureau of Public Roads

Mr. A. M. Monaco, Federal Power Commission

Mr. Lee Townsend, Federal Water Pollution Control Administration

Mr. F. Montanari - Assistant Commissioner, Conservation Dept., New York State
- (a) Task Group #1 - Economic Base Study
- (b) Task Group #4 - Water Supply & Water Quality
- (c) Task Group #8 - Recreation
- (d) Task Group #13 - Public Information

81. In the question and answer period the majority of the questions centered on details of the 14 major reservoirs studied for the basin. Landowners were primarily interested in the maximum pool elevations of the reservoirs in their area. Other questions covered bank erosion, flood control and irrigation water needs.

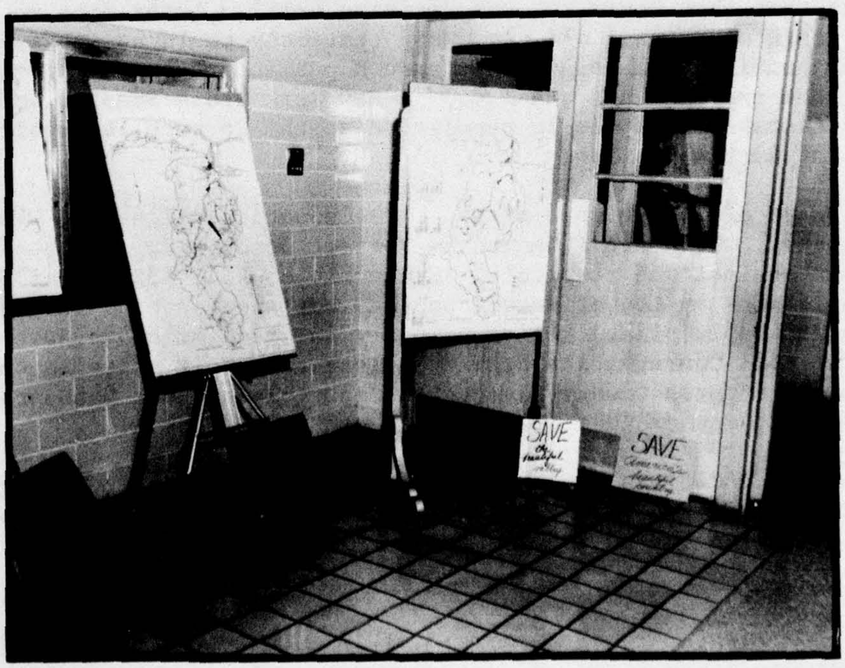
82. The last two Public Hearings were held on 25 and 26 October 1967 at Mount Morris and Rochester, New York. The "Notice of Public Hearing" appears as exhibit A28. The hearings were held by the Genesee River Basin Coordinating Committee with Colonel A. L. Wright and Mr. F. W. Montanari, Assistant Commissioner, Conservation Department, New York State as co-chairmen. The Coordinating Committee members or their representatives in attendance were as follows: Mr. W. L. Anderson, Department of Agriculture; Mr. Handley, Department of the Interior; Mr. J. M. Williams and Mr. G. Kirk, Department of Commerce; Mr. J. H. Spellman, Federal Power Commission; and Mr. N. Kapko, Commonwealth of Pennsylvania. Mr. J. M. Williams represented the Department of Commerce at the Mount Morris hearing and Mr. G. Kirk at the Rochester hearing.

83. The attendance at the two hearings was very large. There were approximately 900 persons at the Mount Morris hearing and 300 persons at the Rochester hearing. The hearings were quite lengthy, but most persons requesting to be heard were allowed to speak and many of the questions submitted were answered. Figure A8 shows a general view of a portion of the Coordinating Committee presentation and a view of displays in the lobby at the Mount Morris Hearing.

84. The hearings were held to consider the proposed basin plan resulting from the comprehensive study, but the key item of interest in the proposed basin plan was the multiple-purpose Portage reservoir.

MOUNT MORRIS PUBLIC HEARING
25 OCTOBER 1967

View of a portion of school auditorium showing Coordinating Committee and a staff member discussing a portion of the Basin Plan.



A view in the school lobby showing part of the Coordinating Committee displays and public comment.

FIGURE A8

The overwhelming consensus of those present was in opposition to the Portage reservoir, in fact there were no speakers in favor of the reservoir. The points cited in opposition to the reservoir were mainly directed along the following lines: the low agricultural evaluation of approximately 8,000 acres of rich bottomland needed for the pool; excessive lands for recreational purposes in light of existing undeveloped state forest land in the basin and in Letchworth State Park; the loss of tax base; the marginal feasibility of power; and failure to include local governments and people in early planning phases of the study.

85. The multiple-purpose Canaseraga Valley project for local flood control and waterfowl habitat improvement met with some opposition also. The portion of the basin plan developed by the Soil Conservation Service which consists of thirty-five upland reservoir sites was favorably received by most of the people present. The smaller reservoirs were probably accepted because less good agricultural land would be required, less loss of tax base would result, local development of recreation potential would be possible and also the Soil Conservation Service worked with the local "Soil and Water Conservation Districts" during the study. No comments were received concerning the proposal for flood plain management services in the Black Creek, Town of Chili, flood area near Rochester.

86. There were no members of Congress present at the hearings due to other commitments in Washington, but Congressmen Charles E. Goodell and Barber B. Conable, Jr., each had a representative present. Both representatives presented prepared statements by the Congressmen to the effect that they would reserve decision until a later date on the proposed basin plan until all views and testimony could be studied. (Since the hearing both Congressmen made a public statement opposing the dam. See exhibits A29 and A30.) A New York State Senator and two State Assemblymen spoke in opposition to the Portage reservoir at the Mount Morris hearing.

87. The Board of Supervisors of the three counties; Allegany, Wyoming and Livingston, which are affected by Portage reservoir, submitted resolutions against the reservoir. See exhibits A31, A32, and A33. These resolutions by the affected counties were not opposed in general to the entire basin plan. Allegany County favored immediate development of the Soil Conservation Service upland reservoir sites in their county and Livingston County favored the multiple-purpose Canaseraga Valley project, see exhibit A34.

88. The recommendations for the basin included in the main report reflect decisions made by the Coordinating Committee subsequent to the Public Hearings of 25 and 26 October 1967.

CHRONOLOGICAL RECORD

89. The major events of the study are recorded in chronological order in table A5. Meetings of the task groups were not included in the following table, but are shown on figure A4.

TABLE A5 - Chronological Record

1 February 1962	- Resolution authorizing study adopted by Committee on Public Works, United States Senate.
2 April 1962	- Original study cost estimate (PB-6) and request to combine Canaseraga Creek study with comprehensive study submitted to higher authority.
9 April 1962	- Combining of the Canaseraga Creek study with the Genesee River Basin study approved by Office, Chief of Engineers.
13 June 1962	- Original "Plan of Survey" for study submitted to North Central Division by Buffalo District.
7 September 1962	- Meeting between Mr. F. W. Montanari, New York State, Conservation Department and Buffalo District to coordinate State effort.
8 October 1962	- Meeting between Mr. F. W. Montanari and Buffalo District to coordinate State effort.
16-17 October 1962	- Meeting, Buffalo District with North Central Division to discuss planning for study.
27 November 1962	- Secretary of Army, Cyrus R. Vance, requested by letter other Federal Secretaries to designate Department representatives for Coordinating Committee.
7 December 1962	- Letter from Department of Commerce, designating representatives for Coordinating Committee.
14 December 1962	- Informational Conference, Genesee River Basin by Temporary State Commission on Water Resources Planning in Rochester, New York.
15 December 1962	- Letter from Federal Power Commission, Mr. Joseph C. Swidler, Chairman, designating representatives for Coordinating Committee.
17 December 1962	- Brigadier General T. DeF. Rogers, Division Engineer, North Central, requested the Governors of New York and Pennsylvania to designate representatives for Coordinating Committee.

20 December 1962 - Letter from Health, Education and Welfare, Mr. J. Celebrezze, Secretary, designating representatives to the Coordinating Committee.

28 December 1962 - Letter from office of Governor Lawrence of Pennsylvania, designating representative on the Coordinating Committee.

18 January 1963 - Second cost estimate (PB-6) submitted to North Central Division by Buffalo District, Corps of Engineers.

22 January 1963 - Letter from Governor Nelson Rockefeller, New York State, to Division Engineer (Brigadier General T. DeF. Rogers) stating New York's interpretation of Corps of Engineers responsibility being limited to review of previous reports with regard to flood control, navigation and those land and water resources related to those two functions. This letter suggests that Division Engineer may wish to reconsider necessity for creating a Coordinating Committee.

30 January 1963 - Meeting Corps of Engineers with New York State to discuss "Economic Base Study."

1 February 1963 - Brigadier General T. DeF. Rogers' letter to Governor Nelson A. Rockefeller requested that he reconsider his letter of 22 January and designate Coordinating Committee member and alternate.

8 March 1963 - Letter from Governor N. A. Rockefeller, New York State, designating New York's member on the Coordinating Committee.

20 March 1963 - Letter from Office, Chief of Engineers authorized transfer of Red Creek Flood Control Project to the Genesee River Basin Comprehensive Study.

22 April 1963 - Letter from Department of Agriculture, Mr. John A. Baker, Assistant Secretary, designates State Conservationist to Coordinating Committee.

24 April 1963 - First Coordinating Committee meeting held at Buffalo District Office.

25 April 1963 - Tour of basin for Coordinating Committee members and their staffs.

18 June 1963 - Second Coordinating Committee meeting at Rochester, New York.

18 June 1963 - Public Hearing held in City Council Chambers, Rochester City Hall, Rochester, New York.

19 June 1963 - Public Hearing held in David Howe Library, Wellsville, New York.

24 June 1963 - North Central Division requested revised draft of "Plan of Survey" and "Cost Estimates" for Genesee River Basin Study to be submitted by 8 July 1963.

10 July 1963 - Specification for Economic Base Study and covering agreement sent to State of New York by Buffalo District.

12 July 1963 - Buffalo District forwarded to Office, Chief of Engineers a revised cost estimate and "Plan of Survey."

26 July 1963 - Corps meeting in Chicago, Illinois with Brigadier General H. W. Penny, OCE, concerning revisions to study cost estimate.

26 July 1963 - Division of Water Resources, Conservation Department, New York State, returned two signed copies of agreement on Economic Base Study to Chairman of Coordinating Committee.

29 July 1963 - North Central Division forwarded copy of "National Economic Growth Projections" by the Economic Task Force of the Ad Hoc Water Resources Council staff.

31 July 1963 - Signed copy of "Economic Base Study Agreement" sent to Water Resource Commission, New York State.

2 August 1963 - Received approved estimate of study cost from Office, Chief of Engineers.

14 August 1963 - Coordinated Budget for FY 1965, submitted to Washington.

14 August 1963	- Outline of reduced scope of study by Water Resources Council sent to New York and Pennsylvania.
27 August 1963	- Preliminary report on Fish and Wildlife resources in the Genesee Basin distributed.
25 September 1963	- Transmitted copies of the "Record of Public Hearing held at Rochester and Wellsville, New York" to all Coordinating Committee members.
29 October 1963	- Transmittal from New York State of a draft report - "Delineation of Genesee River Basin Economic Areas and Subareas," prepared as part of Phase I of the Economic Base Study.
2 December 1963	- FY 1964 Budget for Corps of Engineers Genesee River Basin Study reduced from $150,000 to $125,000.
8 January 1964	- New York State, Division Water Resources' draft of a report, "Partial Inventory of Regional Resources, Phase I" received by Chairman of Coordinating Committee.
13 January 1964	- Preliminary design and cost estimates on Red Creek prepared.
6 February 1964	- Forwarded six copies of "Coordinated Budget of Genesee River Basin Comprehensive study" to the Departments of - Interior, Agriculture and Health, Education and Welfare.
11 February 1964	- A "Revised Plan of Survey" - with Pert type diagram sent to all Coordinating Committee members.
20 February 1964	- Third Coordinating Committee Meeting held at Buffalo District office.
4 March 1964	- Draft of "Interim Report for Flood Control on Red Creek" forwarded to North Central Division.
11 April 1964	- "Genesee River Basin Coordinated Budget" replaced by "Interdepartmental Staff Committee Budget."
20 April 1964	- Meeting in Buffalo District Corps of Engineers office with the Bureau of Outdoor Recreation to discuss future role of B.O.R. participation in study. (Bureau may terminate participation in Genesee River Basin Study at end of FY 1964.)

28 May 1964	- New York State transmitted copies of "Statement of Methodology for Genesee River Basin Economic Study."
5 June 1964	- Inventory of Existing Public Recreation Areas in and around the Genesee River Basin transmitted by the Bureau of Outdoor Recreation.
24 June 1964	- Copies of B.O.R.'s "Inventory of Existing Recreation Areas" transmitted to New York State as part of special data to be supplied to Economic Base Study.
30 June 1964	- "Inventory of Predominant Mineral Resources of Genesee River Basin" by Corps of Engineers transmitted to New York State as part of special data to be supplied to Economic Base Study.
9 July 1964	- Buffalo District office, Corps of Engineers assumed responsibility for Task No. 7 (Power).
11 August 1964	- New York State Conservation Department transmitted draft of "Preliminary Report on Major Demographic and Economic Changes, Genesee River Basin Economic Base Study, Phase I."
1 October 1964	- Transmitted to all Coordinating Committee members copy of proposed "Information Pamphlet" which was presented at an organizational meeting of Task Group #13.
8 October 1964	- The fourth Coordinating Committee meeting was held in Buffalo District office.
16 October 1964	- Distributed draft of "Genesee River Basin Economic Base Study - Phase I" to all Coordinating Committee members.
21 October 1964	- U. S. Fish and Wildlife Service forwarded draft of "Interim Report" based on preliminary evaluation of tentative impoundment sites in the Genesee River Basin.
9 November 1964	- U. S. Geological Survey (Department of the Interior) given the leadership for Task Group No. 6 (Sedimentation).

18 November 1964 - Chairmanship of Task Group No. 8 (Recreation) reassigned to New York State - Conservation Department.

7 December 1964 - Draft of "Major Demographic and Economic Changes, Phase I" by New York State and a booklet of "Special Contributing Studies" by other agencies sent to North Central Division for submittal to Office, Chief of Engineers for review.

7 December 1964 - New York State - Conservation Department assigned the responsibility for Task Group #8 (Recreation) to Division of Parks.

4 January 1965 - From New York State Conservation Department - Division of Water Resources - statement regarding completion of "Economic Base Study, Phase II." Final draft to be complete by 30 September 1965.

21 January 1965 - Distributed to all Coordinating Committee members copies of, "Interim Report on Fish and Wildlife Resources, in Genesee River Basin."

8 April 1965 - Meeting of Buffalo District personnel at North Central Division on Genesee River Basin Comprehensive Study, for review and guidance.

14 April 1965 - Received from the U. S. Department of Agriculture - contributions for the "Economic Base Study" ie.

(1) Agricultural Economy of Genesee River Basin.

(2) Projected Employment and Production in Forest Industries in Economic Areas of the Genesee River Basin.

30 April 1965 - Distributed Directory of Federal and State personnel involved in study.

24 May 1965 - "Interim Report for Flood Control on Red Creek," forwarded in final form to North Central Division.

24 June 1965 - Revised "Plan of Survey" distributed to all Coordinating Committee members.

12 August 1965 - Received by Chairman of Coordinating Committee from New York State - Water Resources Commission copies of report - "Population and Employment Projections, 1970-2020, Genesee River Basin, Economic Base Study, Phase II."

18 August 1965	- Distributed draft of "Genesee River Basin, Economic Base Study, Phase II" to all Coordinating Committee members.
16 September 1965	- Notice of report on Genesee River Basin - "Interim Survey Report for Flood Control on Red Creek, Monroe County, New York" issued.
7 October 1965	- Outlines of Appendices E (Hydrology and Hydraulics), J (Agriculture and Upper Watershed Development), and K (Sediment) sent to all Coordinating Committee members for review.
14 October 1965	- Fifth Coordinating Committee Meeting held at Buffalo District office.
18 October 1965	- "Summary of Water Resources Records at Principal Measurement sites in Genesee River Basin thru 1963" by B. K. Gilbert and J. C. Kammerer received. Prepared by U. S. Department of the Interior, Geological Survey in cooperation with State of New York Conservation Department - Water Resources Commission.
25 October 1965	- Letter from Federal Power Commission notifying Chairman of the Coordinating Committee that Mr. D. J. Wait's membership on the Committee was terminated and that Mr. John Spellman was the new member on the Committee for F.P.C.
27 January 1966	- Orientation session on the Economic Base Study held in the Buffalo District office.
2 February 1966	- Revised submission of "Population and Employment Projections" for Economic Base Study Phase II received from New York State.
1 April 1966	- Letter from Governor of New York State, Nelson Rockefeller, to Chairman of the Coordinating Committee appointing F. W. Montanari and N. Barbarossa as Member and Alternate Member respectively.
12 April 1966	- Appendix "D", Economic Base Study submitted to Board of Engineers for Rivers and Harbors.
19 May 1966	- Notice issued for the Public Information meeting.

8 June 1966	- From U. S. Department of Agriculture, Forest Service, submission of final report of "Projected Employment and Production in the Forest Industries in Economic Areas of Genesee River Basin."
13 June 1966	- Copy of favorable report sent to Bureau of the Budget on Red Creek Flood Control Project by Office, Chief of Engineers.
21-22 June 1966	- Sixth Coordinating Committee Meeting - held at Letchworth State Park, New York.
21 June 1966	- Public Information Meeting held at Mount Morris Central School, Mount Morris, New York.
5 August 1966	- U. S. Department of Agriculture's "Attachment B" for "Appendix K - Sedimentation" received.
22 August 1966	- U. S. Department of Interior - Geological Survey's "Appendix K - Sedimentation" received.
23 August 1966	- Favorable report on Red Creek sent to Chairman, Committee on Public Works, United States Senate.
4 October 1966	- "Preliminary Draft of Appendix K - Sedimentation" sent to all Coordinating Committee members and their staffs for review and comment.
6 October 1966	- "Preliminary Draft of Combined Appendix E & F" sent to all Coordinating Committee members and their staffs for review and comment.
7 November 1966	- Red Creek project authorized by Congress under "Rivers and Harbors Act of 1966."
7 November 1966	- Request from North Central Division to Chairman, Coordinating Committee for a management program to complete study in a reasonable time and the proposed spending program to completion.
8 November 1966	- "Appendix J - Agricultural Studies" sent to all Coordinating Committee members and their staffs for review and comment.
15 December 1966	- "Preliminary Draft of Appendix I, Groundwater" sent to all Coordinating Committee members and their staffs for review and comment.
22 December 1966	- Request to higher authority from Chairman, Coordinating Committee for extension of completion date to February 1968 and $31,000 in additional funds.

6 January 1967 - "Duration, Frequency and Distribution of Streamflow" an Attachment for Appendix H, Water Supply and Water Quality Management sent to all Coordinating Committee members.

11 January 1967 - Request for extension of time and additional funds for study refused by higher authority.

19 January 1967 - "Preliminary Draft of Appendix L, Electric Power" sent to all Coordinating Committee members and their staffs for review and comment.

30 January 1967 - Revised study schedule required to complete study by 30 June 1967 distributed to all members of Coordinating Committee.

9 February 1967 - "Preliminary Draft of Appendix H, Water Supply and Water Quality Management," sent to all Coordinating Committee Members and their staffs for review and comment.

17 February 1967 - "Preliminary Draft - Appendix N, Fish and Wildlife," sent to all Coordinating Committee members and their staffs for review and comment.

14 March 1967 - "Appendix D - Economic Base Study, Part IV, Mineral Economy for Genesee River Basin" sent to all Coordinating Committee members and their staffs for review and comment.

15 March 1967 - Seventh Coordinating Committee meeting held at Buffalo District office.

5 April 1967 - "Time of Travel Studies" an Attachment for "Appendix H, Water Supply and Water Quality Management" sent to all Coordinating Committee members for review and comment.

7 April 1967 - Final draft, photo-ready, of "Appendix K - Sedimentation" received from U. S. Department of the Interior, Geological Survey.

23 May 1967 - U. S. Department of the Interior, Bureau of Outdoor Recreation's report "Genesee River Basin Comprehensive Study of Outdoor Recreation," for inclusion in Appendix M, received.

26 May 1967	- "Appendix J - Agricultural Studies," receipt of final photo-ready copy.
29 May 1967	- "Preliminary Draft, Appendix M, Outdoor Recreation" sent to all Coordinating Committee members and their staffs for review and comment.
10 August 1967	- Copies of Genesee River Basin Comprehensive Study Appendice's were placed in four libraries in the basin (Rochester, Mount Morris, Wellsville and Batavia) for review by the Public prior to a public hearings.
11 August 1967	- "Preliminary Draft, Appendix C, Project Designs and Cost Estimates," sent to all Coordinating Committee members and their staffs for review and comment.
26 September 1967	- "Notice of Public Hearings for Consideration of the Proposed Basin Plan of the Genesee River Basin" issued.
26-28 September 1967	- Meetings held by U. S. Department of Agriculture, Soil Conservation Service, with Local Soil and Water Conservation District Directors at Canandaigua, Rochester, Warsaw, Batavia, Mount Morris and Belmont, New York to explain the Proposed Basin Plan of the Genesee River Basin Study.
4 October 1967	- Advance copies of "Appendix B, Plan Formulation" sent to all Coordinating Committee members.
13 October 1967	- Eighth Coordinating Committee meeting held at Buffalo District office.
25 October 1967	- Public Hearing held at 7:30 p.m. in Mount Morris Central School, Mount Morris, New York.
26 October 1967	- Public Hearing held at 1:30 p.m. at the Farm and Home Center, Rochester, New York.
9 December 1967	- Record of two October public hearings received from court stenographer.
24 January 1968	- "Preliminary Draft, Appendix B - Plan Formulation" sent to all Coordinating Committee members and their staffs for review and comment.

9 February 1968 - Request to higher authority from Chairman, Coordinating Committee for additional funds of $68,000 to complete study in six months from receipt of funds.

13 May 1968 - Receipt of $55,000 by Chairman, Coordinating Committee to complete study, excluding Agency Authorization Report.

19 June 1968 - "Record of Public Hearings - Mount Morris and Rochester - 25 & 26 October 1968" sent to all Coordinating Committee members and their staffs.

21 June 1968 - Interested parties in basin notified of availability of transcript of October "Public Hearings" for purchase from Corps of Engineers.

18 July 1968 - "Preliminary Draft, Appendix A - History of Investigation" sent to all Coordinating Committee members and their staffs for review and comment.

30-31 July 1968 - Ninth Coordinating Committee meeting held at Buffalo District office

27 August 1968 - "Draft of New York State Supplement" sent to all Coordinating Committee members for review and comment.

28 February 1969- Volume VI, Appendices "J" and "K" final printing of 500 copied completed.

2 April 1969 - "Preliminary Draft, Summary Report" sent to all Coordinating Committee members and their staffs for review and comment.

12 May 1969 - Volume IV, Appendices "E" and "F," sent to commercial printer for final printing of 500 copies.

14 May 1969 - Volume V, Appendices "G," "H," and "I," sent to Detroit District, Corps of Engineers for final printing of 500 copies.

26 May 1969 - Comments on "Summary Report" sent to all Coordinating Committee members for their review prior to tenth meeting.

10-11 June 1969 - Tenth Coordinating Committee meeting held at Buffalo District office.

C O P Y

ENGCW-PD Nov 27 1962

The Honorable Luther H. Hodges

The Secretary of Commerce

Dear Mr. Secretary:

A comprehensive study of the Genesee River basin, in New York and Pennsylvania, is being initiated under authority of a resolution adopted 1 February 1962 by the Committee on Public Works of the United States Senate. The resolution reads, in part: "In making this study the Corps of Engineers shall coordinate fully with the State of New York and Commonwealth of Pennsylvania and other Federal agencies concerned to insure full consideration of all views and requirements of all inter-related programs, which those agencies may develop with respect to flood prevention, water supply, stream pollution abatement, recreation, fish and wildlife management, irrigation, soil conservation, hydro-electric power and related water and land resources".

In order to provide for active participation of the several interested Federal departments and agencies and the States in accomplishing an integrated plan for comprehensive development, it is proposed to form a coordinating committee consisting of one representative each from the Departments of Interior, Agriculture, Commerce, and Health, Education and Welfare; the Federal Power Commission; and one representative each from the States of New York and Pennsylvania. The District Engineer, U. S. Army Engineer District, Buffalo, who has been assigned the responsibility for the investigation in response to the Congressional resolution, will be the representative of the Department of the Army and will be chairman of the committee.

The coordinating committee will: provide an organization for full and continuing exchanges of views during the study; advise and assist all participating agencies with regard to objectives, work assignments, and schedules; assist in the resolution of study problems as they arise; and make periodic review of progress. Although the States and Federal

ENGCW-PD
The Honorable Luther H. Hodges

departments may have more than one interested agency, it would be preferable that each State and each Federal department or independent agency have only one formal representative and an alternate in the interest of keeping the committee at a practical size. Additional informal representatives could, however, participate in meetings whenever their presence would aid in meeting committee objectives. Normal field-level coordinating arrangements will also be maintained.

As soon as representatives have been designated, the Chairman will arrange a meeting of the Committee. At the first meeting, consideration will be given to the functions and responsibilities of each agency and to the scheduling and funding of its work, as well as to procedural matters, including frequency and place of meetings. Sub-committees may be organized for specific purposes.

I trust that you will designate, as soon as convenient, a representative and an alternate from your Department to serve on the Genesee River Basin Study Coordinating Committee.

Sincerely yours,

(Signed)

Cyrus R. Vance
Secretary of the Army

COPY

DEPARTMENT OF AGRICULTURE
WASHINGTON 25, D. C.

April 22 1963

Honorable Cyrus R. Vance
Secretary of the Army

Dear Mr. Secretary:

This is in further response to your letter of November 27, 1963, requesting the Department of Agriculture to designate a representative to serve on the Genesee River Basin Survey Coordinating Committee. Your letter advises us that the main function of this committee will be to provide for full and continuing exchange of views during this study, to assist all participating agencies with respect to objectives, work assignments, and schedules, to assist in the resolution of study problems and to make periodic review of the progress being made.

The Department of Agriculture is glad to participate in the survey of the Genesee River Basin. Its interest and responsibilities have to do primarily with the agricultural and forestry resources of the basin. We are particularly concerned with the formulation of plans which will provide for full development of the water and related land resources of the upstream watersheds and for the coordination of proposed upstream and main stem improvements.

The Soil Conservation Service has been assigned general responsibility for river basin surveys and investigations in which this Department cooperates under authority of Section 6 of Public Law 566, 83d Congress, as amended. We are designating Mr. Irving B. Stafford, State Conservationist of the Soil Conservation Service for New York, to serve as the representative of the Department of Agriculture on the Coordinating Committee. We are also designating Mr. R. D. Perry of the Soil Conservation Service to serve as alternate for Mr. Stafford. Mr. Stafford will make appropriate arrangements for participation of other concerned agencies of this Department in the Genesee River Basin Survey.

We request that notification of meetings and other committee affairs be directed to Mr. Stafford, whose address is Soil Conservation Service, 236 West Genesee Street, Syracuse 2, New York. Mr. Perry's address is the same as Mr. Stafford's.

Sincerely yours,

John A. Baker

John A. Baker
Assistant Secretary

EXHIBIT A2

THE SECRETARY OF COMMERCE
WASHINGTON 25, D.C.

Honorable Cyrus R. Vance
Secretary of the Army
Washington 25, D. C.

December 7, 1962

Dear Mr. Secretary:

As requested in your letter of November 27, 1962, I am designating Mr. George E. Kirk, Hydraulics Engineer of the Bureau of Public Roads regional office at Delmar, New York, as the Department of Commerce representative on the Genesee River Basin Study Coordinating Committee. Mr. Kirk is quite familiar with the problems in the Genesee Valley. His address is: U.S. Bureau of Public Roads, 4 Normanskill Boulevard, Delmar, New York.

I am also designating Mr. John M. Williams, Meterologist in charge of the Weather Bureau office at Rochester, New York, as the alternate Department of Commerce representative on the Genesee River Basin Study Coordinating Committee. Mr. Williams is active in flood forecasting work and is also familiar with the problems involved in the Genesee study. His address is: U.S. Weather Bureau, Airport Station, Rochester, New York.

Your courtesy in providing for Department of Commerce representation in this study is appreciated.

Sincerely yours,

Edward Gudeman

Secretary of Commerce

EXHIBIT A3

THE SECRETARY OF HEALTH, EDUCATION, AND WELFARE
WASHINGTON

20 December 1962

Dear Mr. Secretary:

We are pleased to name Mr. William Q. Kehr as our representative on the proposed coordinating committee for the Genesee River comprehensive investigation outlined in your letter of November 27, 1962. Mr. Kehr is presently director of the Great Lakes-Illinois River Basin Water Quality Management Project, Division of Water Supply and Pollution Control, Department of Health, Education, and Welfare, 1819 West Pershing Road, Chicago 9, Illinois.

We suggest that Mr. Charles R. Ownbey, located at the same address as that of Mr. Kehr, be named as his alternate on this committee.

Sincerely yours,

Secretary

Honorable Cyrus R. Vance
Secretary of the Army
Washington 25, D. C.

EXHIBIT A4

FEDERAL POWER COMMISSION
WASHINGTON 25

December 15, 1962

Honorable Cyrus R. Vance
Secretary of the Army
Washington 25, D. C.

Dear Mr. Secretary:

This is in response to your letter of November 27, 1962, concerning the forthcoming comprehensive study of the Genesee River basin and inviting the Commission to designate a representative and alternate to serve on the Genesee River Basin Study Coordinating Committee.

The Commission is glad to cooperate with the Corps of Engineers in this study of the Genesee River basin. I am designating Mr. Day J. Wait and Mr. John H. Spellman to serve as the Federal Power Commission's representative and alternate, respectively, on the Genesee River Basin Study Coordinating Committee. Mr. Wait is Regional Engineer of the Commission's Regional Office at 346 Broadway, New York 13, New York, and Mr. Spellman is Deputy Regional Engineer of that office.

Sincerely,

Joseph C. Swidler

Joseph C. Swidler
Chairman

EXHIBIT A5

COMMONWEALTH OF PENNSYLVANIA

GOVERNOR'S OFFICE

HARRISBURG

SECRETARY TO THE GOVERNOR

December 28, 1962

Brig. Gen. T. DeF. Rogers
Division Engineer, North
Central Division
Corps of Engineers, U. S. Army
536 South Clark Street
Chicago 5, Illinois

Dear General Rogers:

Your letter of December 17th, File NCDDE, requested that Governor Lawrence name a representative and an alternate from the Commonwealth of Pennsylvania to serve on the Coordinating Committee for the comprehensive study of the Genesee River Basin in New York and Pennsylvania and to coordinate the efforts of the Commonwealth with those of the Federal agencies involved in the study.

Governor Lawrence has requested that I convey his designation of Hon. Maurice K. Goddard, Secretary of Forests and Waters, as Pennsylvania's representative on the Committee. Secretary Goddard was our representative on the highly-successful Coordinating Committee for the Delaware River Basin and is also our representative on the newly-formed Coordinating Committee for the Susquehanna River Basin survey.

Inasmuch as the mechanism and procedures for effectively handling the necessary coordination between the many agencies involved have already been established within the Department of Forests and Waters, we are designating a member of Secretary Goddard's staff, Mr. Alan J. Sommerville, Chief Water Resources Development Engineer, to serve as his alternate on the Committee.

Very truly yours,

Roy W. Schafer

EXHIBIT A6

STATE OF NEW YORK
EXECUTIVE CHAMBER
ALBANY

NELSON A. ROCKEFELLER
GOVERNOR

March 8, 1963

Dear General Rogers:

This is in response to your letter of February first regarding the Genesee Basin Study.

I welcome your designation of Colonel Hamerly to serve with the State's committee for the coordination of studies related to the development of a comprehensive plan. It is our hope that this committee will prove of assistance to the Corps in carrying out its responsibility, under the Senate Committee on Public Works resolution, to "coordinate fully with the State of New York and Commonwealth of Pennsylvania and other Federal agencies concerned..."

The State of New York has a paramount and immediate interest in the development of comprehensive water resources plans for the Basin, which is almost entirely within the State. This interest carries with it a responsibility which the State coordinating committee device is designed to help fulfill. It is our interpretation of the resolution authorizing Corps participation that it recognizes the interest and responsibility of the State in this instance.

As to your request for State representation on the Corps coordinating committee with regard to Corps responsibilities under the resolution, I am pleased to designate Dr. Harold G. Wilm, Chairman of the State Water Resources Commission, to participate in the activities of the Corps committee. Dr. Wilm will provide you with the name of his alternate.

Sincerely,

Nelson Rockefeller

Brigadier General T. DeF. Rogers
Division Engineer
U. S. Army Engineer Division,
North Central
Corps of Engineers
536 South Clark Street
Chicago 5, Illinois

EXHIBIT A7

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Room 400 Midtown Plaza
700 East Water Street
Syracuse, New York
13210

July 22, 1964

Lt. Col. William F. Pence
Deputy District Engineer
U.S. Army Engineer District
Foot of Bridge St.,
Buffalo, N.Y. 14207

Dear Colonel Pence:

Mr. Irving B. Stafford, who formerly represented the Department of Agriculture on the Genesee River Basin Coordinating Committee, retired from his position as State Conservationist for the Soil Conservation Service in New York on January 31, 1964. My appointment as State Conservationist was effective February 1, 1964.

I have no formal appointment by the Secretary of Agriculture to the Coordinating Committee, but it is one of the duties assigned to the State Conservationist for New York, which I will assume.

Sincerely yours,

Wallace L. Anderson

Wallace L. Anderson
State Conservationist

EXHIBIT A8

U. S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION ONE
4 NORMANSKILL BLVD.
DELMAR, N. Y. 12054

May 16, 1967
IN REPLY REFER TO:
01-00.4

Colonel R. Wilson Neff
Buffalo District Corps of Engineers
Foot of Bridge Street
Buffalo, New York 14207

Dear Colonel Neff:

I am sure you are aware that on April 1, 1967, the Bureau of Public Roads became an agency of the newly created Department of Transportation.

I have recently been advised that the Department of Transportation has concluded an agreement with the Department of Commerce under which Bureau of Public Roads and Weather Bureau employees, who previously represented the Department of Commerce on various Water Resources Coordination Committees throughout the country, would continue to represent both departments until such time as each department appointed separate representatives.

Accordingly, I will act, until further notice, as a representative of the Department of Commerce, on the Genesee River Basin Coordination Committee.

Please continue to furnish me with ten copies of all material requiring agency review.

Sincerely yours,

G E Kirk, Jr.

George E. Kirk, Jr.
Commerce Representative
Genesee River Basin
Coordination Committee

EXHIBIT A9

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20315

IN REPLY REFER TO
ENGCW-PP

24 August 1966

SUBJECT: Department of Health, Education and Welfare Designated Representatives for Inter-Agency Activities

TO: Division Engineer
North Central Division

Inclosed is a copy of a list of persons designated by the Department of Health, Education, and Welfare to represent that Department in Comprehensive Basin Planning Studies and in inter-agency activities. It is suggested that the designated representatives be contacted directly concerning comprehensive study coordination matters.

FOR THE CHIEF OF ENGINEERS:

1 Incl
as

ROBERT R. WERNER
Lt Colonel, Corps of Engineers
Assistant Deputy Director of
Civil Works for Comprehensive
Planning

EXHIBIT A10

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
Washington, D.C. 20201

Department of Health, Education, and Welfare Designated Representatives for Inter-Agency Basin Activities:

	Name	Region
Arkansas White-Red Basins Inter-Agency Committee (ICWR)	E. Ruppert	VII
Columbia Basin Inter-Agency Committee (ICWR)	R. W. Hart	IX
Missouri Basin Inter-Agency Committee (ICWR)	F. Erickson	VI
Northeastern Resources Committee (ICWR)	F. Tetzlaff	I
Pacific Southwest Inter-Agency Committee (ICWR)	R. W. Hart	IX
Delaware River Basin Federal Field Committee	S. C. Martin	II
Southeast Basins Inter-Agency Committee	H. W. Chapman	IV
Water Development Coordination Committee for Appalachia	J. D. Faulkner	III

Type I - Coordinated Comprehensive Framework Surveys

North Atlantic Region	S. C. Martin	II
Ohio River Region	J. D. Faulkner	III
Upper Mississippi Region	R. E. Novick	V
Missouri River Region	F. Erickson	VI
Columbia River - North Pacific Drainage Region	R. W. Hart	IX

Type II - Coordinated Comprehensive Detailed Surveys

St. John	F. Tetzlaff	I
Connecticut	F. Tetzlaff	I
Genesee	S. C. Martin	II
Susquehanna	S. C. Martin	II
Kanawha	J.D. Faulkner	III
Grand	R. E. Novick	V
Wabash	R. E. Novick	V

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
9000 ROCKVILLE PIKE
BETHESDA, MD. 20014

REFER TO:

OCT 4 1967

Dear Colonel Neff:

This letter is in reference to the Health, Education, and Welfare member on the Genesee River Basin Study Coordinating Committee. Mr. Sylvan C. Martin, our current member, is being transferred to North Carolina.

His replacement will be Mr. Ralph J. Van Derwerker, Acting Associate Regional Health Director for the Bureau of Disease Prevention and Environmental Control, Public Health Service, Region II, New York City. Mr. Van Derwerker has extensive experience and familiarity with water-related fields, and we believe, will make a good contribution to the work of your Committee.

Sincerely yours,

Albert H Stevenson

Albert H. Stevenson
Assistant Surgeon General
and Chief Engineer
Departmental Representative to
Water Resources Council

Colonel R. Wilson Neff
Chairman, Genesee River Basin
Study Coordinating Committee
Department of the Army
Buffalo, New York 14207

EXHIBIT A11

FEDERAL POWER COMMISSION
REGIONAL OFFICE
346 BROADWAY
NEW YORK 13, NEW YORK

October 25, 1965

Colonel R. Wilson Neff
Corps of Engineers
Chairman, Genesee River Basin
Coordinating Committee
Foot of Bridge Street
Buffalo, N. Y. 14207

Re: NCBED-B

Dear Colonel Neff:

In reply to your letter of October 19, 1965, Mr. D. J. Wait's membership on the Genesee River Basin Coordinating Committee was terminated on May 20, 1965. Since that time, I have been Acting Regional Engineer and as such have been responsible for the duties of that office which include membership on the several Coordinating Committees in our regional area.

Sincerely yours,

John H. Spellman

John H. Spellman
Acting Regional Engineer

EXHIBIT A12

FEDERAL POWER COMMISSION
REGIONAL OFFICE
346 Broadway
New York, New York 10013

January 14, 1966

Col. R. Wilson Neff, District Engineer
Corps of Engineers, U. S. Army
Foot of Bridge Street
Buffalo, New York 14207

Dear Colonel Neff:

This is in reply to your letter of January 10, 1966 concerning FPC representation on the Genesee River Basin Coordinating Committee.

I inadvertently omitted mentioning in my letter of October 25, 1965 on this matter, that a new FPC alternate member to the Committee has not been appointed.

Sincerely yours,

JOHN H. SPELLMAN

John H. Spellman
Acting Regional Engineer

EXHIBIT A13

FEDERAL POWER COMMISSION
REGIONAL OFFICE
346 BROADWAY
NEW YORK, NEW YORK 10013

October 31, 1966

Colonel R. Wilson Neff, Chairman
Genesee River Basin Coordinating Committee
Buffalo District, Corps of Engineers
Foot of Bridge Street
Buffalo, New York 14207

Dear Colonel Neff:

As you undoubtedly know by now, I have been transferred to New York City to fill the Regional Engineer's position left vacant by Mr. Day Wait's resignation. This transfer will necessitate some changes in the Federal Power Commission's representation on the various Coordinating Committees and other groups with which we are associated.

In the case of the Genesee River Basin Coordinating Committee, Mr. Spellman, Deputy Regional Engineer, will continue as the Federal Power Commission "Member" of the Committee and Mr. Angelo M. Monaco, Engineer-In-Charge of our River Basins Division, will be the "Alternate".

Sincerely,

Paul H. Shore

Paul H. Shore
Regional Engineer

EXHIBIT A14

STATE OF NEW YORK
EXECUTIVE CHAMBER
ALBANY

NELSON A. ROCKEFELLER
GOVERNOR

April 1, 1966

Dear Colonel Neff:

Dr. Harold G. Wilm, who was New York's representative on the Genesee River Basin Study Coordinating Committee, resigned as Conservation Commissioner effective February 3, 1966.

This is to designate Mr. F. W. Montanari, Assistant Commissioner for Water Resources, Conservation Department, to replace Dr. Wilm and Mr. Nicholas L. Barbarossa, Assistant Director, Division of Water Resources, Conservation Department, as alternate to Mr. Montanari.

I am confident that these men will be most helpful in the work of the Coordinating Committee.

Sincerely,

Nelson Rockefeller

Colonel R. Wilson Neff, Chairman
Genesee River Basin Study Coordinating Committee
Buffalo District, Corps of Engineers
Foot of Bridge Street
Buffalo, New York 14207

EXHIBIT A15

Genesee River Basin Coordinating Committee
Agenda for First Meeting - Foot of Bridge Street, Buffalo, N.Y. -
24 April 1963 - 10:30 A.M.

I. Introductory remarks
   1. Welcome
   2. Introduction of participants
   3. Purpose of meeting

II. Background information
   1. National program of basin studies
   2. Previous and current studies
   3. Authorizing resolution
   4. General description of basin

III. Coordinating committee
   1. Precedent
   2. Functions
   3. Organization
   4. Terms of reference
   5. Administration

      A. Time, place and frequency of meetings
      B. Minutes, notices and other procedures
      C. Subcommittees

IV. Description of basin
   1. Physical features
   2. Economic and industrial development

V. Plan of survey

VI. Statements covering: completed studies, studies underway; and problems know to exist
   1. Corps of Engineers
   2. Department of the Interior
   3. Department of Agriculture
   4. Department of Commerce
   5. Department of Health, Education and Welfare
   6. Federal Power Commission
   7. State of New York
   8. Commonwealth of Pennsylvania

VII. Study procedures

VIII. Public hearings
   1. Number, place and time
   2. Notice

IX. Work proposed in remainder of Fiscal Year 1963
    1. Corps of Engineers

        A. Continuing studies
        B. Surveys
        C. Subsurface exploration

    2. Other agencies (in turn)

X. Economic base study
    1. Scope
    2. Discussions to date
    3. Draft specifications
    4. Needs of other agencies

XI. Funding
    1. Corps of Engineers schedule
    2. Requirements of other agencies

XII. Discussion

XIII. Next meeting
    1. Time and place
    2. Items to be included in agenda

        A. Priority of studies
        B. Reports
        C. Other

AGENDA

Genesee River Basin Coordinating Committee
Second Meeting - City Hall, Rochester, New York
18 June 1963 - 9:00 A.M.

I. Introductory remarks

II. Minutes previous meeting

  1. Any left over business

III. Reservoir sites to be studied

IV. Sub-Committees

V. Agencies reports

  1. To cover activities since previous meeting (Informal talk, 2-5 minute duration)

VI. Working drafts (of Economic Base Study and Plan of Survey)

  1. Purpose
  2. Continual use
  3. Two phases
  4. Description of GRB Service Area
  5. Committee's comments

VII. Anticipated study procedures

  1. General approach
  2. Assignment of studies

VIII. Funding

IX. Standard distribution list

X. Base maps

XI. Tour

XII. Public hearing procedures

XIII. Next Meeting

AGENDA

Genesee River Basin Coordinating Committee

Third Meeting - Buffalo, New York

20 February 1964 - 10:00 A.M.

I. Minutes of previous meeting

II. Plan of survey - discussion of plan, to be distributed prior to meeting, emphasizing listing of agency responsibilities in paragraph 13 and work schedules in PERT and CPM type diagram

III. Progress reports

1. Reports by agencies

2. Report of task group

IV. Reservoir studies - status of studies by Corps of Engineers and discussion of related studies to be made by other agencies

V. Information booklet - discussion of need for, format of, and distribution of a booklet

VI. Current status of budgets - all agencies

VII. Next meeting

VIII. Economic base study

1. Progress reports by New York and Agriculture

2. Discussion of report on areas of major change (Paragraph 10a of Appendix B of agreement for economic base study).

3. Discussion of special studies (Paragraph 7 of Appendix B).

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EXHIBIT A18

GENESEE RIVER BASIN COORDINATING COMMITTEE
AGENDA

Fourth Meeting - Buffalo, N. Y.

8 October 1964 - 10:00 A. M. (EDT)

MORNING SESSION: 10:00 A. M. - 12:30 P. M.

I. Introductory remarks.

II. Minutes of previous meeting.

III. Progress reports.

1. Departmental reports - (by Committee members).
2. Task group reports - (by responsible Agency representatives).

IV. Revised plan of survey - (by Corps).

1. Current status.
2. Task group procedures.
3. Tentative table of contents for final main report.
4. Questions and comments.

V. Interim Report for Red Creek.

1. Presentation - (by Corps).
2. Questions and comments.

AFTERNOON SESSION: 2:00 P. M. - 4:30 P. M.

VI. Information bulletin.

1. Status report - (by New York State, Dept. of Commerce).
2. Discussion of information to be distributed to general public.
3. Questions and comments.

VII. Coordinated budget for Federal agencies - (by Corps).

VIII. Reservoir site studies.

1. Headwaters reservoirs - (by Soil Conservation Service).
2. Main stem and major tributary sites - (by Corps).
3. Questions and comments.

IX. Statement of flood problem, vicinity of Scio, N. Y. - (by Corps).

X. Water laws discussion - (possible use of existing data prepared by the States for other basin studies).

1. State of New York.
2. Commonwealth of Pennsylvania.

XI. Economic base study, Phase I.

1. Presentation - (by New York State, Dept. of Commerce).
2. Questions and comments.

XII. Next meeting.

EXHIBIT A19

GENESEE RIVER BASIN COORDINATING COMMITTEE

AGENDA
for
Fifth Meeting

Buffalo, New York

CONFERENCE PERIOD.

FIRST DAY - 13 OCTOBER 1965 10:00 AM - 12:30 PM; 2:00 PM - 4:30 PM

SECOND DAY- 14 OCTOBER 1965 9:00 AM - 12:30 PM; 2:00 PM - 4:00 PM

FIRST DAY

I. Introductory remarks.

Chairman - Coordinating Committee

II. Minutes of previous meeting.

Chairman - Coordinating Committee

III. Remarks and comments of Coordinating Committee Members. (approx. 5 minutes each)

Interior representative

Agriculture representative

Health, Education & Welfare representative

Commerce representative

Federal Power representative

State of New York representative

Commonwealth of Pennsylvania representative

IV. Progress reports

1. Task group reports. (Each responsible agency representative - approximately 15 min. duration).

a. Presentation in sequence:

No.	Task	Agency	Chairman
1	Economics	N. Y.	Dickson
3	Hydrology	Corps	Liddell
4	Quality	N. Y.	Grossman
5	Agriculture	Ag.	Perry
6	Sedimentation	USGS	Heath
7	Power	Corps	Williamson
8	Recreation	N. Y.	Harvey
9	Fish & Wildlife	F & WL	Schmidt
10	Needs	Corps	Williamson
11	Screening	Corps	Williamson
13	Public Info.	N. Y.	Moylan

b. Questions and comments.
(following each report)

2. Departmental reports.
(Optional presentation by Coordinating Committee members of items not covered by Task Group reports).

SECOND DAY:

V. Program for Appalachia.
(By Corps of Engineers personnel)

VI. Statement on Red Creek status.
(By Corps of Engineers personnel)

VII. State water laws.

1. Progress

New York - By State representative

Pennsylvania - By State representative

2. Proposed amendment to real property and proceedings law, introduced by Senator VanLare, 10 March 1965, Print 2962 Intro. 2806, copy attached.
(Discussion of amendment and relationship to Conesus and Honeoye Lakes by New York Representative)

VIII. Final basin report discussions.
(Basic presentation by Corps of Engineers. participation by all members desired).

1. Main report outline.

2. Appendix outlines.

   a. Task group report preparation.

   b. Individual agency responsibilities and reports.

   c. Report integration.

3. Comments on task group report outlines.

4. Plate format.

5. Colors.

IX. Local flood protection project, Canaseraga Creek.

1. Presentation of proposed improvements by Corps of Engineers.

2. Presentation and discussion proposed Fish and Game impoundments by New York representative.

3. Discussion possible news release by New York representative.

X. Open discussion period.

(Additional topics, questions or comments by members).

XI. Next Meeting.

Winter: 16-17 February 1966 or 2-3 March 1966

Spring: 22-23 June 1966 or 29-30 June 1966
(To review drafts of appendices, due by 1 June 1966).

1 Attachment
as

AD-A041 703 CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT F/G 8/6
GENESEE RIVER BASIN COMPREHENSIVE STUDY OF WATER AND RELATED LA--ETC(U)
JUN 69

UNCLASSIFIED NL

2 OF 6
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2 OF 6

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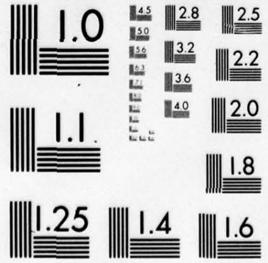


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

ATTACHMENT A

GENESEE RIVER BASIN COORDINATING COMMITTEE

AGENDA

for

Sixth Meeting

Letchworth State Park, New York

Administration Building

CONFERENCE PERIOD

FIRST DAY - 21 JUNE 1966 1:00 p.m. - 5:00 p.m.

SECOND DAY - 22 JUNE 1966 9:00 a.m. - 1:00 p.m.

FIRST DAY:

1:00 p.m. I. Introductory remarks

Chairman - Coordinating Committee

1:15 II. Welcome to Letchworth State Park

Regional Park Manager

1:20 III. Minutes of previous meeting

1:25 IV. Remarks and comments of Coordinating Committee Members

Interior representative

Agricultural representative

Health, Education & Welfare representative

Commerce representative

Federal Power representative

State of New York representative

Commonwealth of Pennsylvania representative

2:00 V. Progress reports

1. Task group reports
(Each responsible agency representative - approximately 5-10 min. duration)

EXHIBIT A21

a. Presentation in sequence:

No.		Agency
1	Economics	N.Y.
3	Hydrology	Corps
4	Quality	N.Y.
5	Agriculture	Ag.
6	Sedimentation	U.S.G.S.

3:00-3:15 Break

7	Power	Corps
8	Recreation	N.Y.
9	Fish & Wildlife	F & W
10	Needs	Corps
11	Screening	Corps
13	Public Info	N.Y.

b. Questions and comments (following each report).

2. Departmental reports (Optional presentation by coordinating committee members of items not covered by task group reports)

4:15 VI. Discussion of public information meeting

5:00 Close of afternoon session

SECOND DAY:

9:00 a.m. VII. Open discussion period (Questions or comments by members on first day session and/or public information meeting)

9:20 VIII. Report cover

9:30 IX. Scheduling of review for appendices

1. Discussion of review procedures

   a. Submission of draft of task group report to Corps

   b. Reproduction of report by Corps

   c. Review distribution list

   d. Period of time required for review

   e. Written comments will be submitted for attachment to appendix

   f. Coordinating and incorporating comments in final report

10:00 2. Discussion and establishment of firm dates for submission of draft appendices and review periods. (Each responsible agency representative shall be prepared to present realistic dates for this report and/or appendix).

No.	Title	Preparation by
A	History of Investigation	Corps of Engineer
B	Public Information Program	Task Group #13
C	Water Laws	N.Y. & Pa.
D	Economic Base Study	Completed
E	Hydrology	Task Group #3

10:30-10:45 Break

No.	Title	Preparation by
F	Flood Control	Task Group #3
G	Geology	Corps of Engineer
H	Water Supply and Water Quality	Task Group #4
I	Groundwater Resources	Task Group #4
J	Agriculture	Task Group #5
K	Sediment	Task Group #6
L	Electric Power	Task Group #7
M	Outdoor Recreation	Task Group #8
N	Fish and Wildlife	Task Group #9
O	Project Designs and Cost Estimates	Corps of Engineer
P	Formulation of Alternative Projects and Basin Plans, Economic Analysis	Task Group #12

11:45 X. Data bank & retrieval

12:00 m. XI. Southern tier expressway vs reservoir sites

12:15 p.m. XII. Open discussion period (Additional topics, questions and/or comments by members)

12:55 XIII. Next meeting

GENESEE RIVER BASIN COORDINATING COMMITTEE

AGENDA

for

SEVENTH MEETING

DISTRICT OFFICE, CORPS OF ENGINEERS

BUFFALO, NEW YORK

CONFERENCE PERIOD

15 March 1967 9:30 a.m.-1:00 p.m.: 2:00 p.m.-4:30 p.m.

9:30 a.m. I. Introductory remarks

Chairman - Coordinating Committee

9:45 II. Minutes of previous meeting

Chairman - Coordinating Committee

9:50 III. Discussion of recommended program schedule for completion of study

1. Schedule - Chairman, Coordinating Committee
2. Impact, views and data imput deficiency by various other agencies - Agency representative

10:25 IV. Status of preliminary drafts of appendices

1. Report (By Corps personnel)
2. Questions and comments

10:40 V Proposed Plans

1. General progress of Plan Formulation Group

11:00-11:15 Break

2. Canaseraga Creek project
3. Portage reservoir project
4. S.C.S. plans

12:05 p.m. VI. Remarks and comments of Coordinating Committee Members

(approx. 5 minutes each)

Interior representative

Agriculture representative

Health, Education & Welfare representative

Commerce representative

Federal Power Commission representative

State of New York representative

Commonwealth of Pennsylvania representative

12:55 Lunch

2:10 VII. Number of copies of Final Report

1. Each member of Coordinating Committee shall present his requirements.
2. Determine total number of copies to be printed

2:30 VIII. Discussion of the future activities of Task Group #13

1. Appendix B - Public Brochure - deleted
2. Need for summary brochure after completion of report
3. Need for and type of news releases

2:50 IX. Final report and appendices

1. Appendices
   a. Review of comments by Task Groups
   b. Notification of action taken by Task Group to agency originating comments
   c. Submission of photo-ready copy to Corps
2. Final report
   a. Date of submission for review

b. Length of time for review period

c. Written comments will be submitted to append to report

3:30 X. Public Hearing - 19 July 1967

3:45 XI. Open discussion period

(Additional topics, questions and/or comments by members).

GENESEE RIVER BASIN COORDINATING COMMITTEE

AGENDA

for

EIGHTH MEETING

DISTRICT OFFICE, CORPS OF ENGINEERS

BUFFALO, NEW YORK

13 October 1967

8:30 a.m. I. Introductory remarks - Col. A. L. Wright

1. Welcome
2. Purpose of meeting
3. Minutes of previous meeting - 15 March 1967

8:40 a.m. II. Remarks of Coordinating Committee Members (Brief statements, if any).

8:50 a.m. III. Discussion of proposed basin plan - C. of E.

1. Appendix B - Plan formulation
2. Review of basin needs & problems
3. Proposed basin plan
4. Individual projects - C. of E.
5. Headwater projects - S.C.S.
6. Recreation lands
7. General discussion

10:20 a. m. Break

10:45 a.m. IV. Discussion of public hearings

1. Proposed agenda

2. C. of E. presentation

3. S.C.S. presentation

4. Statements by C.C. members

5. Layout for the hearing

6. Travel & lodging arrangements

7. General discussion

1:00 p.m. Lunch

2:15 p.m. V. Open discussion period

(Any unfinished business, additional topics, questions and/or comments by members).

GENESEE RIVER BASIN COORDINATING COMMITTEE

AGENDA

for

Ninth Meeting

at

DISTRICT OFFICE, CORPS OF ENGINEERS

1776 NIAGARA STREET

BUFFALO, NEW YORK

CONFERENCE PERIOD

FIRST DAY - 30 JULY 1968 10:00 a.m. - 4:30 p.m.

SECOND DAY - 31 JULY 1968 9:00 a.m. - 1:00 p.m.

FIRST DAY:

10:00 a.m. I. Introductory remarks
(Chairman - Col. A. L. Wright)

10:15 a.m. II. Minutes of previous meeting
(Chairman - Col. A. L. Wright)

10:20 a.m. III. Remarks, comments and any additions to agenda by Coordinating Committee Members.

Interior representative

Agricultural representative

Health, Education & Welfare representative

Commerce representative

Federal Power representative

State of New York representative

Commonwealth of Pennsylvania representative

EXHIBIT A24

10:50 a.m.	IV.	Discussion of recent Water Resource Council actions: 1. Comments on Sabine River, Type II, Study (by C of E) 2. Preliminary projections for ERS & FS, based on census "C" projection instead of census "B" (by S.C.S.) 3. Office, Chief of Engineers views on summary report and agency authorization report (by C of E)
11:20-11:35	Break	
11:35	V.	Presentation and discussion of New York's report by Harza Engineering and State Appendix (Representative of New York State)
12:10	VI.	Progress Report on Appendices 1. General Status (Corps of Engineers) 2. Photo-ready copy; 6 appendices complete, 8 appendices incomplete. (by appropriate Task Group chairman of incomplete appendix)
12:30	Lunch	
1:30 p.m.	VII.	Discussion of October 1967 Public Hearings and impact on Basin Plan (Moderator - Col. A. L. Wright)
2:30	VIII.	Discussion and proposals for Recommended Basin Plan of projects and land treatment programs of the Department of Agriculture (Moderator - Wallace Anderson)
3:15-3:30	Break	
3:30	IX.	Discussion of Corps of Engineers projects for the Recommended Basin Plan (Corps of Engineers personnel)

4:00	X.	Discussion of Basin Plan to be Recommended (Moderator - Col. A. L. Wright) (Each member, please, be prepared to present a Basin Plan which his agency would like to have Coordinating Committee recommend.)
4:30		Adjourn for day.
		<u>SECOND DAY</u>:
9:00 a.m.	X.	Discussion of Basin Plan to be Recommended by Coordinating Committee (continued)
10:00	XI.	Recommended Basin Plan by Coordinating Committee (Col. A. L. Wright)
10:30-10:45		Break
10:45	XII.	Main Report Outline (Corps of Engineers)
11:00	XIII.	Completion Schedule for Report (Corps of Engineers)
11:15	XIV.	Publishing of Report (Corps of Engineers) 1. Number of copies 2. Volumes contents 3. Appendices ready for printing
11:30	XV.	Open Discussion Period (Additional Topics, questions and/or comments by members)

12:30 p.m.	**XVI.**	**Authorization Reports** **(Corps of Engineers & Soil Conservation Service)**
12:50	**XVII.**	**Next meeting**
1:00 p.m.		**Adjourn**

GENESEE RIVER BASIN COORDINATING COMMITTEE

AGENDA

for

Tenth Meeting

at

DISTRICT OFFICE, CORPS OF ENGINEERS

1776 NIAGARA STREET

BUFFALO, NEW YORK

CONFERENCE PERIOD

FIRST DAY - 10 JUNE 1969	9:00 a.m. - 4:00 p.m.
SECOND DAY - 11 JUNE 1969	8:30 a.m. - 1:35 p.m. (approx.)

FIRST DAY:

9:00 a.m. I. Introductory remarks
(Chairman - Col. A. L. Wright)

9:15 a.m. II. Minutes of previous meeting
(Chairman - Col. A. L. Wright)

9:20 a.m. III. Remarks, comments and any additions to agenda by Coordinating Committee Members.

Interior representative

Agricultural representative

Health, Education & Welfare representative

Commerce representative

Federal Power representative

State of New York representative

Commonwealth of Pennsylvania representative

EXHIBIT A25

9:35 a.m.	IV.	Status report on publishing and funding. (Corps of Engineers personnel)
9:45	V.	Progress report and discussion of "New York State Supplement," Volume VIII of report. (New York State representative)
10:00	VI.	Discussion of mailing published report and appendices (Corps of Engineers personnel)
10:15	BREAK	
10:30	VII.	Discussion of guidelines for revision of "Summary Report" (Chairman - Col. A. L. Wright)
11:00	VIII.	Discussion of new appendix "N," Fish & Wildlife (Interior and Corps of Engineers personnel)
11:45	LUNCH	
1:20 p.m.	IX.	Discussion of comments on "Summary Report." (Moderators - Col. A.L. Wright and appropriate Department representative)
		1. Interior comments
2:30	BREAK	
2:45		2. Agriculture comments
3:45		3. Federal Power Commission comments
3:55		4. Commerce comments
4:05	Adjourn for day	
	SECOND DAY:	
8:30 a.m.	IX.	Continuance of discussion of comments from first day.
		5. New York State comments
10:15	BREAK	
10:30		6. Health, Education and Welfare comments
10:45		7. Commonwealth of Pennsylvania comments
11:00		8. Great Lakes Basin Commission comments
12:00 noon		9. Army - North Central Division comments

1:00 p.m.	X.	Finalizing of "Summary Report" (Moderator - Col. A. L. Wright)
1:15 p.m.	XI.	Publishing of "Summary Report." (Corps of Engineers personnel)
1:20	XII.	Open discussion period (Additional topics, questions and/or comments by members)
1:30	XIII.	Next meeting (No further meetings are anticipated unless requested by Water Resource Council after submission of report)
1:35	Adjourn	(Actual time of adjournment will depend on time required for discussion of comments and finalizing of report)

GENESEE RIVER BASIN COORDINATING COMMITTEE
c/o U. S. Army Engineer District, Buffalo
Corps of Engineers
Foot of Bridge Street
Buffalo 7, New York

and

STATE OF NEW YORK
WATER RESOURCES COMMISSION
Conservation Department
Albany 1, New York

NOTICE OF PUBLIC HEARING

ON GENESEE RIVER BASIN, NEW YORK AND PENNSYLVANIA

FOR FLOOD CONTROL, NAVIGATION, AND OTHER RELATED WATER AND LAND RESOURCES

In order that the planning activities may cover the matter fully, public hearings jointly conducted by the New York State Water Resources Commission and the Genesee River Basin Coordinating Committee will be held as follows:

City Council Chambers
Rochester City Hall
Broad Street
Rochester, New York
at 1:30 p.m. (EDT) on
18 June 1963

David Howe Library
North Main Street
(Routes 17 and 19)
Wellsville, New York
at 1:30 p.m. (EDT) on
19 June 1963

RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Board of Engineers for Rivers and Harbors created under Section 3 of the River and Harbor Act approved June 13, 1902, be and is hereby requested to review the reports on the Genesee River, New York, contained in House Document 615, 78th Congress, 2nd Session, and other reports, with a view to determining whether any modification of the basin-wide plans should be made at this time with respect to improvements for flood control, navigation, and other related water and land resources. In making this study the Corps of Engineers shall coordinate fully with the State of New York and Commonwealth of Pennsylvania and other Federal agencies concerned to insure full consideration of all views and requirements of all inter-related programs, which those agencies may develop with respect to flood prevention, water supply, stream pollution abatement, recreation, fish and wildlife management, irrigation, soil conservation, hydro-electric power and related water and land resources.

Pursuant to the above resolution, adopted 1 February 1962, the duty of making the comprehensive basin study has been assigned to the District Engineer, U. S. Army Engineer District, Buffalo.

Because of the complexities of inter-related water and land resources programs, the Genesee River Basin Coordinating Committee has been formed, consisting of members of the Departments of Army, Interior, Agriculture, Commerce, Health-Education and Welfare and the Federal Power Commission, the State of New York and the Commonwealth of Pennsylvania with the District Engineer as Chairman.

The New York State Water Resources Commission, under Article V of the Conservation Law, may undertake comprehensive planning activities for the protection, conservation, development and beneficial utilization of the water resources of the State.

All interested parties, including representatives of Federal, State, county, and municipal agencies, and those of commercial, industrial, civic, highway, railroad, and flood control interests, and property owners concerned, are invited to be present or represented at either or both of the hearings at the time and place designated for each on the preceding page. The Rochester hearing will be concerned principally with areas below Mount Morris and the hearing at Wellsville with the remainder of the basin, but information may be presented at either hearing at the convenience of the speaker. All parties present will be afforded full opportunity to express their views concerning the character and extent of improvements desired and the need and advisability of their execution. Sponsors of improvements are urged to present pertinent factual material bearing upon the general plan of improvement desired and the economic justification of the undertaking. Opposing interests, if any, are also urged to state the reasons for their position.

Definite, detailed and accurate information is desired on the following, if pertinent:

a. Extent and character of areas affected by floods; frequency, nature and dollar value of flood damages; and improvements desired as remedial measures;

b. Needs and prospective plans, if any, for future development of water supply for domestic, industrial and agricultural use;

c. Extent of pollution of streams, if any, and proposed measures for eliminating pollution;

d. Needs and prospective plans, if any, for provision of areas for water-oriented recreation;

e. Needs and prospective plans, if any, for provision of areas for fish and wildlife management;

f. Demand for, and prospective benefits from, provision of water supply for supplemental irrigation;

g. Needs for soil conservation measures;

h. Other proposals for development of water and land resources;

i. The extent to which local interests will cooperate in bearing the cost of improvements, including:

(1) Provision of necessary lands, easements and rights-of-way necessary for improvements, access roads, and lands needed for construction purposes, at no cost to the United States;

(2) Release of the United States from all claims for damages due to construction, maintenance, and operation of improvements;

(3) Taking over, maintaining, and operating the improvements after construction, in accordance with regulations to be prescribed by the Secretary of the Army;

j. Extent of cash or other contributions toward the cost of any of the desired improvements, that may be expected by the United States from the State, municipal or other local, public, or private interests; and

k. Requests for improvements should be accompanied by statements as to the probable beneficial effects that such improvements may have.

Oral statements will be heard but for accuracy of record all important facts and arguments should be submitted IN WRITING (EIGHT COPIES REQUIRED), as the records of the hearing will be forwarded for consideration by the Department of the Army and the New York State Water Resources Commission. Written statements may be handed to the undersigned at the hearing or mailed to one of them beforehand.

Attention of all interested parties is invited to the fact that the River and Harbor Act approved 2 March 1945 (Public Law 14, 79th Congress, 1st Session) recognizes "the interest and rights of the States" in matters pertaining to rivers, watersheds, and water utilization and control. The law outlines the method whereby the Department of the Army shall consult with the Governor of the State, or his designated agent, during the prosecution of authorized flood control and navigation investigations. In New York, the Governor has designated the Chairman of the New York State Water Resources Commission as his representative. The designated representative of the Governor of Pennsylvania is the Secretary, Department of Forests and Waters.

The holding of this hearing does not indicate that the United States will construct the desired improvements as construction can be started only after the enactment of additional legislation authorizing any improvement recommended as a result of this review.

You are requested to communicate the foregoing to any persons known by you to be interested in the improvement, and who, not being known to this office, do not receive a copy of this communication.

NEW YORK STATE
WATER RESOURCES COMMISSION

H. G. Wilm, Chairman
Conservation Commissioner
New York State
Conservation Department
Albany 1, New York

GENESEE RIVER BASIN
COORDINATING COMMITTEE

Colonel Leon J. Hamerly, Chairman
District Engineer
U. S. Army Engineer District, Buffalo
Corps of Engineers
Foot of Bridge Street
Buffalo 7, New York

NOTICE
OF
PUBLIC INFORMATION MEETING
FOR
GENESEE RIVER BASIN COMPREHENSIVE STUDY

TUESDAY, 21 JUNE 1966, 8 P.M., E.D.T.
AUDITORIUM
MOUNT MORRIS CENTRAL SCHOOL
MOUNT MORRIS, NEW YORK

The public is invited to attend a public information meeting to be conducted by the Genesee River Basin Coordinating Committee, which has been engaged since late 1962, in a comprehensive study of the "related water and land resources" of the Basin. This study is being made through the joint efforts of several Federal and State agencies which are represented by the following members on the Genesee River Basin Coordinating Committee:

U. S. DEPARTMENTS
OF
ARMY - INTERIOR
AGRICULTURE - COMMERCE
HEALTH, EDUCATION AND WELFARE
AND
FEDERAL POWER COMMISSION

STATES
OF
NEW YORK - PENNSYLVANIA

The study is giving consideration to determining needs and possible solutions for flood prevention, water supply, stream pollution abatement, recreation, fish and wildlife management, irrigation, soil conservation and hydroelectric power. Information is still of a preliminary nature and should be regarded as such. An opportunity will be provided for the public to ask questions at the conclusion of the presentation.

R. Wilson Neff
R. WILSON NEFF
Colonel, Corps of Engineers
Chairman, Genesee River Basin
Coordinating Committee
Department of the Army
Buffalo District, Corps of Engineers
Foot of Bridge Street
Buffalo, New York 14207

EXHIBIT A27

GENESEE RIVER BASIN COORDINATING COMMITTEE
Buffalo District, Corps of Engineers
Foot of Bridge Street
Buffalo, New York 14207

NCBED 26 September 1967

NOTICE OF PUBLIC HEARINGS

FOR CONSIDERATION OF THE

PROPOSED BASIN PLAN

OF THE

GENESEE RIVER COMPREHENSIVE STUDY

7:30 P.M. E.D.T., 25 October 1967
Mount Morris Central High School
Auditorium
Mount Morris, New York

1:30 P.M. E.D.T., 26 October 1967
Farm & Home Center Auditorium
249 Highland Avenue
Rochester, New York

The comprehensive study of the Genesee River Basin which is entering its final stages was authorized by the following resolution:

"RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Board of Engineers for Rivers and Harbors created under Section 3 of the River and Harbor Act approved June 13, 1902, be and is hereby requested to review the reports on the Genesee River, New York, contained in House Document 615, 78th Congress, 2nd Session, and other reports, with a view to determining whether any modification of the basin-wide plans should be made at this time with respect to improvements for flood control, navigation, and other related water and land resources. In making this study the Corps of Engineers shall coordinate fully with the State of New York and Commonwealth of Pennsylvania and other Federal agencies concerned to insure full consideration of all views and requirements of all inter-related programs, which those agencies may develop with respect to flood prevention, water supply, stream pollution abatement, recreation, fish and wildlife management, irrigation, soil conservation, hydroelectric power and related water and land resources."

Pursuant to the above resolution, sponsored by Senator Jacob K. Javits, requested by the New York State Water Resources Commission and adopted 1 February 1962, the duty of making the comprehensive basin study was assigned to the District Engineer, Buffalo District, Corps of Engineers.

Because of the complexities of inter-related water and land resources programs, the Genesee River Basin Coordinating Committee was formed, consisting of members of the Department of Army; Interior; Agriculture; Commerce; Health, Education and Welfare; and the Federal Power Commission,

the State of New York and the Commonwealth of Pennsylvania, with the District Engineer as Chairman.

The comprehensive study is now nearing completion and a proposed plan for the Basin has been developed to meet part of the present and future Basin needs. In order that the final report may include all views on the proposed plan, interested parties are invited to be present or represented at one or both of the two public hearings on 25 or 26 October 1967 to discuss the proposals. Testimony given at one hearing will not have to be repeated at the other hearing, since all testimony will become part of the public record of the joint hearings. Everyone will be afforded full opportunity to express his or her views on the nature and extent of the basin plan, individual projects, and the required items of local cooperation. The hearings will be jointly chaired by Colonel A. L. Wright, Corps of Engineers and F. W. Montanari, Assistant Commissioner of Water Resources in the New York State Conservation Department.

In general, the Federal-State agencies involved in the comprehensive study have concluded that the major resources and needs of the basin through the year 2020 are as shown on inclosure 1. To best meet these present and future needs, the Coordinating Committee is proposing the Basin Plan as shown on inclosure 2. Some of the items shown are eligible for Federal participation in funding, some are not eligible under existing Federal law for assistance and some require differing degrees of local cooperation.

The major projects in the proposed basin plan are the multiple-purpose, main-stem reservoir at Portageville, the multiple-purpose Canaseraga Creek Project and many Soil Conservation Service structures for varied purposes.

The Portage Reservoir Project is shown on inclosure 3. It was found to be the most economical site of 14 major reservoir sites studied by the Corps of Engineers to meet basin needs. The reservoir would be multiple-purpose for low flow augmentation, power and recreation. Low flow releases from the reservoir would eliminate the water quality problem in the Genesee River to the Barge Canal crossing at Rochester. Power, 200,000 K.W. would be generated to aid the daily peak load demands in upstate New York. The powerhouse would be underground with reversible pump-turbine units utilizing an average gross head of 460 feet resulting from the dam and three falls in Letchworth State Park. The lake formed by the reservoir would be an important addition of water-associated recreation needs of the western New York area. The land area required to form this lake would be 4,100 acres for the conservation pool, 3,400 acres for the flood control pool, and 2,000 acres for minimum recreation lands. The suggested recreation area, as shown on inclosure 3, would be an additional 10,600 acres. Thus the total acreage proposed for recreation would be 12,600 acres and the total project acreage would be 20,100 acres. It is anticipated that the proposed project would have an annual visitation for such recreational activities as swimming, boating, fishing and camping of 2,000,000 visitor-days and 400,000 fisherman-days.

The Canaseraga Creek project's main purpose would be local flood protection of the agricultural valley land and improvement of the wildfowl habitat. It would provide for approximately 15 miles of channel improvement along Canaseraga Creek, 4,000 feet along Keshequa Creek, 6,900 feet along Bradner Creek and 3,900 feet along the State Canal consisting of enlargement of the channel, replacement and removal of bridges and a levee upstream of White Bridge. The project would also include a retention structure across the valley downstream of Keshequa Creek. The provisions for wildfowl habitat would include two permanent ponding areas upstream of the confluence with Keshequa Creek and one temporary ponding area along Bradner Creek, State Canal and route 258 which would be drained every spring prior to 15 May for agricultural planting.

The Basin Plan, inclosure 2, includes many Soil Conservation Service headwater reservoirs. Some are single purpose and others are multiple-purpose sites. The reservoir sites proposed are the results of their investigations which included topographic map studies and field reconnaissance of 226 preliminary headwater reservoir sites, the screening of these sites and the detailed engineering studies of the more promising 95 sites. The structures are described in the following paragraphs and a typical section of a dam is shown on inclosure 4.

Water retarding structures are designed and built by the Soil Conservation Service to perform one or more of several functions. These include flood protection, reduction of sediment damage, municipal and agricultural water supply, recreation lakes, and the development of fish and wildlife habitat. The sectional drawing, attached as inclosure 4, shows the functional elements of a typical multi-purpose structure, which includes storage for sediment, floodwater, and a recreation lake.

The structure consists of three basic components, the embankment, the principal spillway and the emergency spillway. The embankment is constructed of compacted earth fill. The fill material is usually obtained from the emergency spillway excavation, though it may be necessary to find other sources.

The principal spillway consists of the outlet pipe, the riser, and the impact basin. The outlet pipe is normally constructed of reinforced concrete pipe. The riser is a rectangular concrete shaft which serves to conduct water to the outlet pipe.

The emergency spillway is an earth channel excavated around the end of the dam. Both the dam and the emergency spillway are seeded to provide vegetative cover.

The important characteristic of this structure is that it is self-operating. There are no outlet gates which require opening and closing to control floods. The rate of flow out of the reservoir is controlled by the selection of an appropriate size outlet conduit. In time of flood, more water enters the reservoir than can be discharged through the outlet conduit.

This excess water is temporarily stored between the recreation lake level and the emergency spillway level. When the flood has passed, the excess water is gradually discharged through the outlet pipe.

A sufficient volume of storage is provided between the recreation lake level and the emergency spillway level so that a flood expected to occur not more than once in 100-years will be controlled by the structure. Should a flood greater than this occur, it is passed through the emergency spillway. The height of the dam is selected so that a flood of the maximum probable magnitude will not overtop the structure.

Oral statements will be heard but for accuracy of record all important facts and arguments should be submitted <u>IN WRITING (TWO COPIES REQUIRED)</u>, as the records of the hearings will be forwarded for consideration by reviewing agencies. Written statements may be handed to the undersigned at the hearings or mailed to him beforehand.

The holding of these hearings <u>CANNOT</u> be taken as indication that the United States will construct the considered improvements. Construction in most cases can be started only after the enactment of additional legislation authorizing an improvement which may be recommended as a result of this comprehensive study.

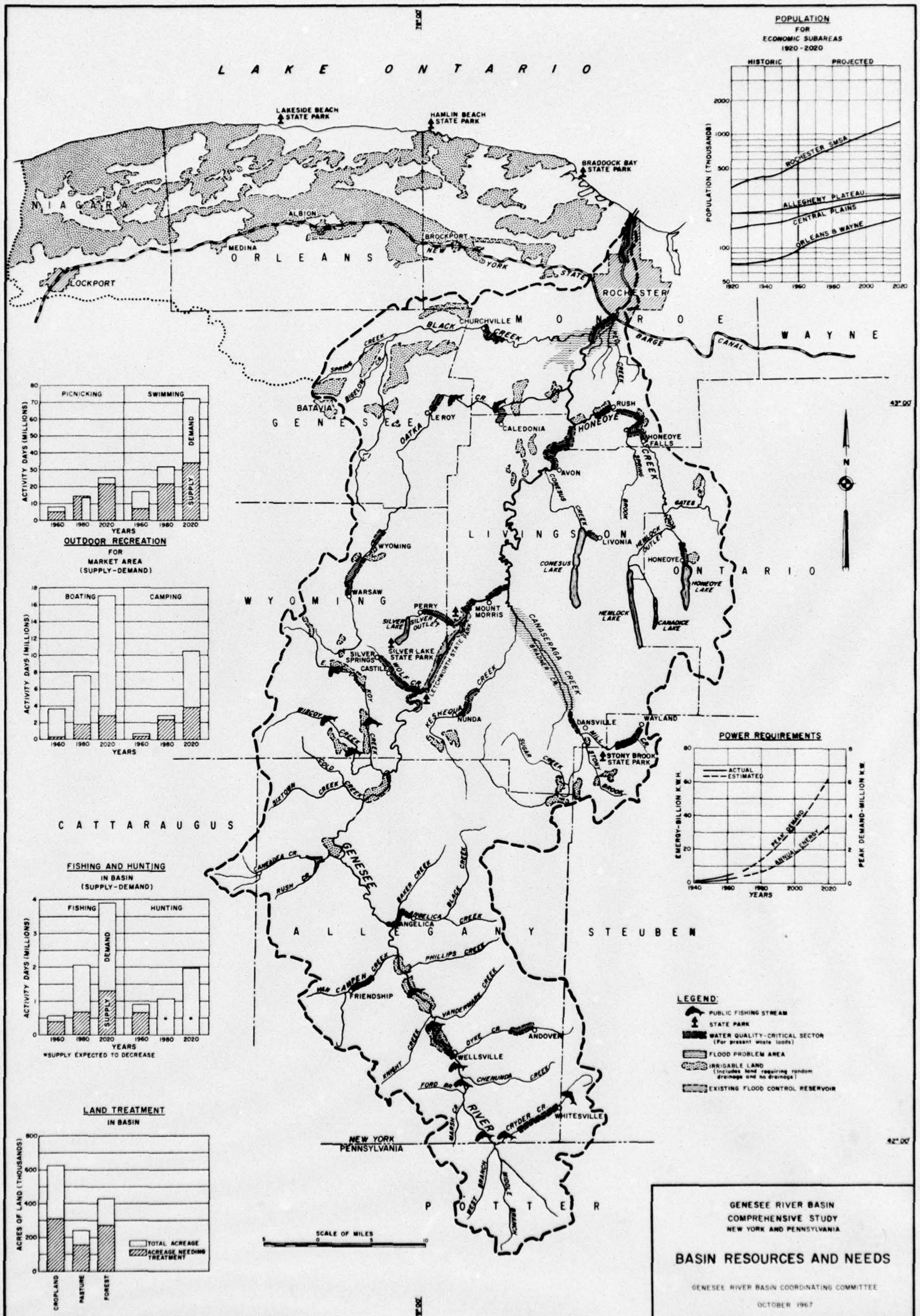
You are requested to communicate the foregoing to any persons known by you to be interested in the comprehensive study, and who, not being known to this office, do not recieve a copy of this communication.

Genesee River Basin
Coordinating Committee

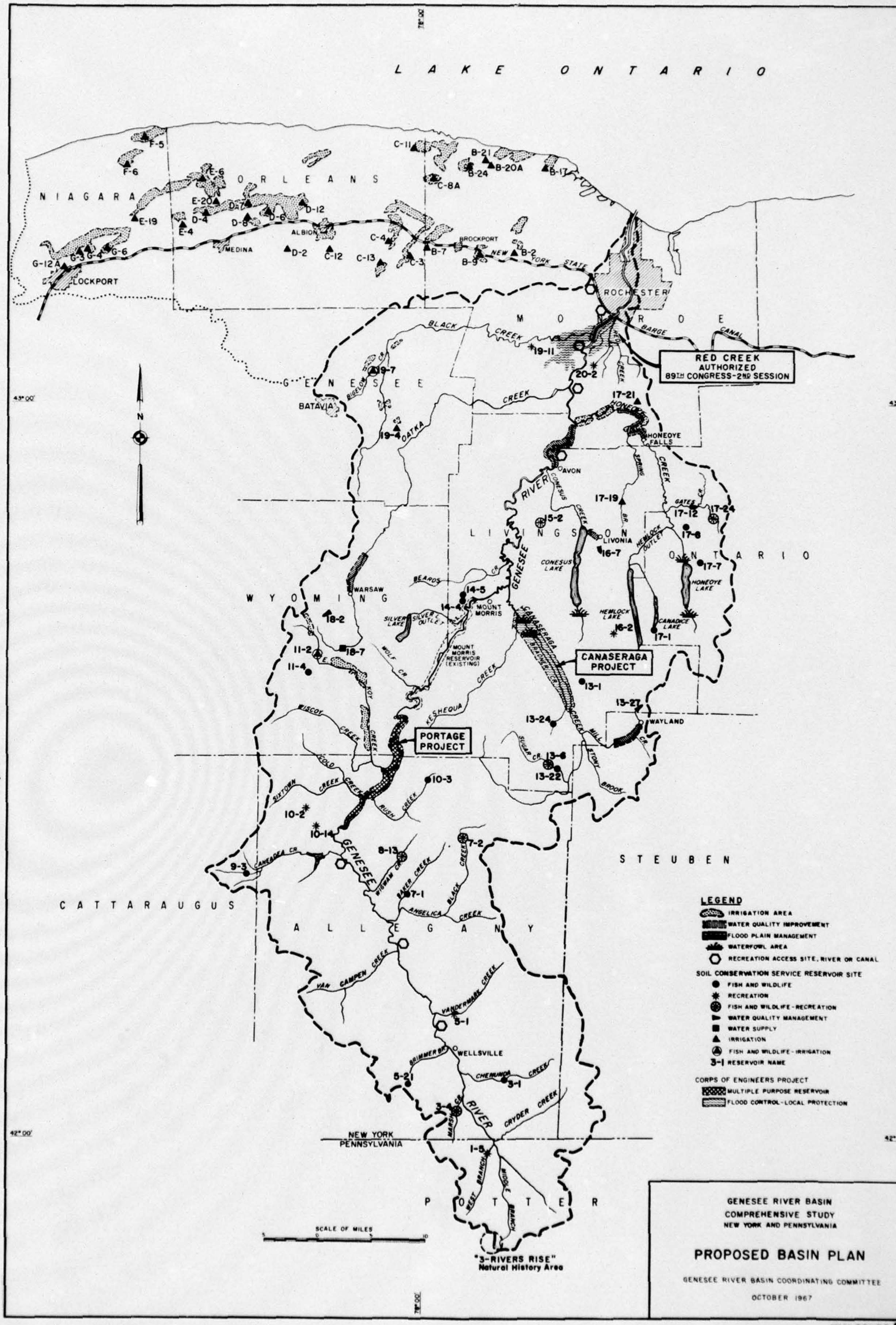
A L Wright

A. L. WRIGHT
Colonel, Corps of Engineers
District Engineer
Chairman, Coordinating Committee

4 Incl
1. Basin Needs
2. Proposed Basin Plan
3. Proposed Portage Reservoir
4. Typical Soil Conservation Service Dam


LAKE ONTARIO
LAKESIDE BEACH STATE PARK
HAMLIN BEACH STATE PARK
BRADDOCK BAY STATE PARK
NIAGARA
ALBION
MEDINA
ORLEANS
BROCKPORT
NEW YORK STATE BARGE CANAL
LOCKPORT
ROCHESTER
MONROE
WAYNE
CHURCHVILLE
BLACK CREEK
SPRING CREEK
BIGELOW CREEK
BATAVIA
GENESEE
LE ROY
OATKA CR
CALEDONIA
RUSH
HONEOYE CREEK
HONEOYE FALLS
AVON
CONESUS CREEK
SPRING BROOK
LIVINGSTON
LIVONIA
HEMLOCK OUTLET
CONESUS LAKE
HEMLOCK LAKE
CANADICE LAKE
HONEOYE LAKE
HONEOYE
ONTARIO
WYOMING
WARSAW
PERRY
SILVER LAKE
SILVER LAKE OUTLET
SILVER LAKE STATE PARK
MOUNT MORRIS
SILVER SPRINGS
CASTILE
WOLF CR
LETCHWORTH STATE PARK
CANASERAGA CREEK
KESHEQUA CREEK
NUNDA
DANSVILLE
WAYLAND
MILL CR
STONY BROOK STATE PARK
SUGAR CREEK
CATTARAUGUS
SIXTOWN CREEK
CANEADEA CR
RUSH CR
GENESEE
BAKER CREEK
BLACK CREEK
ANGELICA
ALLEGANY
STEUBEN
PHILLIPS CREEK
VAN CAMPEN CREEK
FRIENDSHIP
VANDERMARK CREEK
DYKE CR
ANDOVER
WELLSVILLE
CHENUNDA CREEK
FORD BR
RIVER
CRYDER CR
WHITESVILLE
NEW YORK
PENNSYLVANIA
POTTER
WEST BRANCH
MIDDLE BRANCH
SCALE OF MILES
43° 00'
42° 00'
78° 00'
N
POPULATION
FOR
ECONOMIC SUBAREAS
1920-2020
HISTORIC
PROJECTED
POPULATION (THOUSANDS)
ROCHESTER SMSA
ALLEGHENY PLATEAU
CENTRAL PLAINS
ORLEANS & WAYNE
OUTDOOR RECREATION
FOR
MARKET AREA
(SUPPLY-DEMAND)
PICNICKING
SWIMMING
BOATING
CAMPING
ACTIVITY DAYS (MILLIONS)
DEMAND
SUPPLY
YEARS
FISHING AND HUNTING
IN BASIN
(SUPPLY-DEMAND)
FISHING
HUNTING
*SUPPLY EXPECTED TO DECREASE
LAND TREATMENT
IN BASIN
ACRES OF LAND (THOUSANDS)
TOTAL ACREAGE
ACREAGE NEEDING TREATMENT
CROPLAND
PASTURE
FOREST
POWER REQUIREMENTS
ACTUAL
ESTIMATED
ENERGY-BILLION K.W.H.
PEAK DEMAND-MILLION K.W.
PEAK DEMAND
ANNUAL ENERGY
LEGEND:
PUBLIC FISHING STREAM
STATE PARK
WATER QUALITY-CRITICAL SECTOR (For present waste loads)
FLOOD PROBLEM AREA
IRRIGABLE LAND (Includes land requiring random drainage and no drainage)
EXISTING FLOOD CONTROL RESERVOIR
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
BASIN RESOURCES AND NEEDS
GENESEE RIVER BASIN COORDINATING COMMITTEE
OCTOBER 1967

INCLOSURE #1


LAKE ONTARIO
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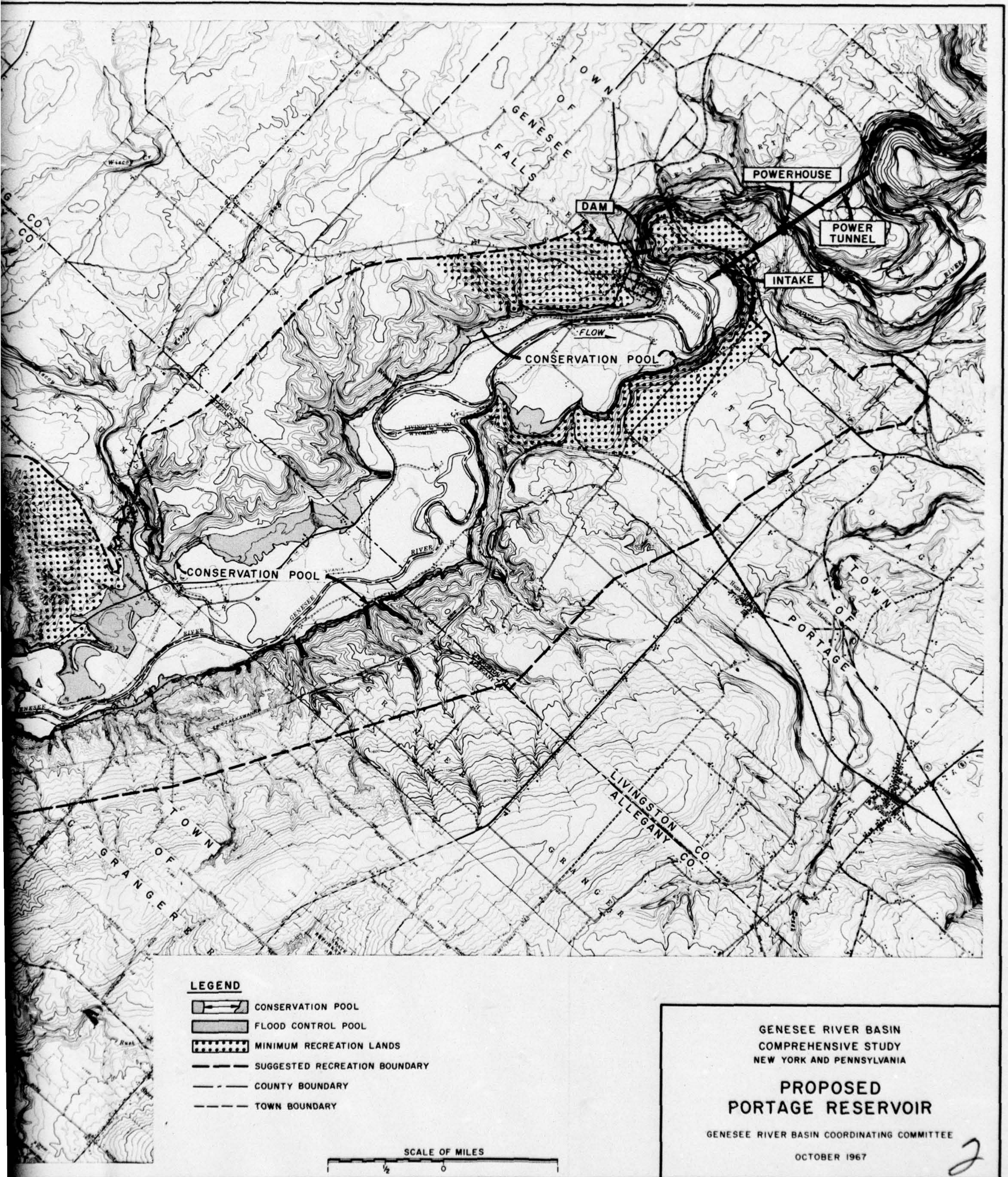
ALLEGANY
POTTER
LOCKPORT
MEDINA
ALBION
BROCKPORT
ROCHESTER
BATAVIA
NEW YORK STATE BARGE CANAL
RED CREEK
AUTHORIZED
89TH CONGRESS-2ND SESSION
HONEOYE FALLS
AVON
LIVONIA
CONESUS LAKE
HEMLOCK LAKE
CANADICE LAKE
HONEOYE LAKE
WARSAW
SILVER LAKE
MOUNT MORRIS
MOUNT MORRIS RESERVOIR (EXISTING)
CANASERAGA PROJECT
PORTAGE PROJECT
WAYLAND
WELLSVILLE
NEW YORK
PENNSYLVANIA
"3-RIVERS RISE"
Natural History Area
SCALE OF MILES
LEGEND
IRRIGATION AREA
WATER QUALITY IMPROVEMENT
FLOOD PLAIN MANAGEMENT
WATERFOWL AREA
RECREATION ACCESS SITE, RIVER OR CANAL
SOIL CONSERVATION SERVICE RESERVOIR SITE
FISH AND WILDLIFE
RECREATION
FISH AND WILDLIFE-RECREATION
WATER QUALITY MANAGEMENT
WATER SUPPLY
IRRIGATION
FISH AND WILDLIFE-IRRIGATION
3-1 RESERVOIR NAME
CORPS OF ENGINEERS PROJECT
MULTIPLE PURPOSE RESERVOIR
FLOOD CONTROL-LOCAL PROTECTION
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
PROPOSED BASIN PLAN
GENESEE RIVER BASIN COORDINATING COMMITTEE
OCTOBER 1967

INCLOSURE # 2


N
WYOMING CO
ALLEGANY CO
TOWN OF HUME
LEVEE
LEVEE
CONSERVATION POOL
FLOW
TOWN OF GRANGER
TOWN OF CANEADEA
LEGEND
CONSERVATION
FLOOD CONTROL
MINIMUM RECRE
SUGGESTED REC
COUNTY BOUNDA
TOWN BOUNDARY



GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

PROPOSED PORTAGE RESERVOIR

GENESEE RIVER BASIN COORDINATING COMMITTEE

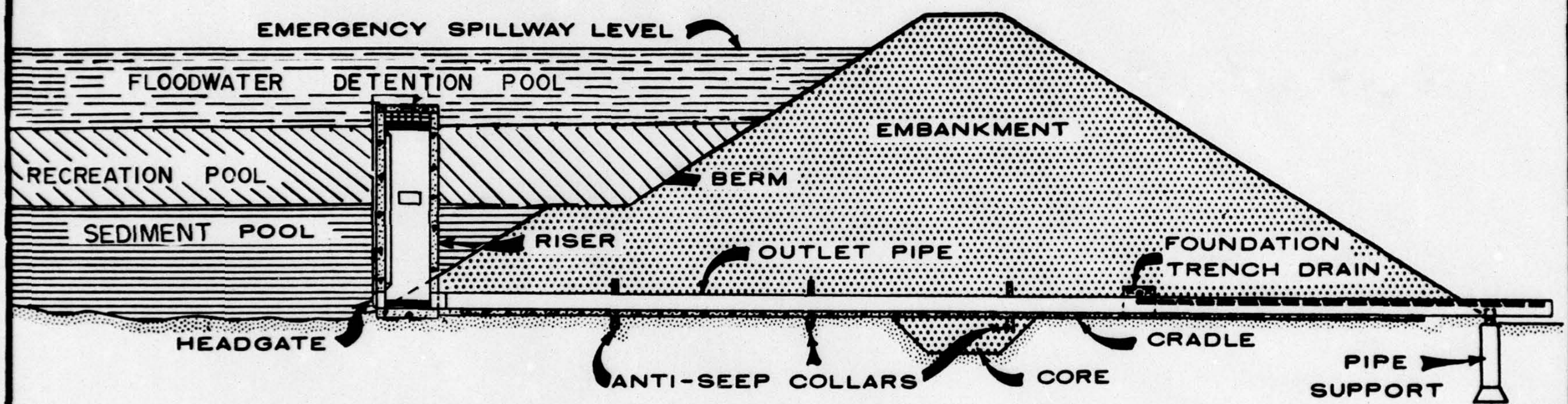
OCTOBER 1967

2

INCLOSURE # 3

U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE



SECTION OF A TYPICAL FLOODWATER RETARDING STRUCTURE

WITH RECREATIONAL STORAGE ADDED

INCLOSURE 4

Your Congressman

103 Cannon House Office Bldg.
Washington, D.C. 20515

CHARLES E. GOODELL

Reports from Washington

November 15, 1967

Not Printed At Government Expense 10

THE PROPOSED PORTAGEVILLE DAM

The Genesee River Basin Coordinating Committee has proposed a massive project on that river at Portageville. If constructed, it would cost many millions of dollars and take some of the finest farm land in the country. After a careful study of the information presently available, including the indicated cost-benefit ratio, I have announced my very strong opposition to the proposal.

When considered in the light of extremely marginal cost-benefit ratios, the loss of highly valuable farm land makes it imperative that the Coordinating Committee reconsider its suggestion. I am urging this Committee to immediately consider all possible alternatives. While it is important that we continue to develop plans for flood control, as well as improved recreational facilities and adequate power, particularly for our rural areas, the construction of the proposed dam at Portageville will not in my opinion meet those needs in the best possible way.

Improved flood control CAN be developed through increased use of smaller water-retaining structures along the lines of the highly successful watershed programs. Existing recreational areas CAN be developed at a substantially lower cost through the improvement of local State Parks and existing lakes.

Careful studies of power needs and new technical developments in the field of nuclear power should be explored before further plans are continued.

In view of these critical factors, I am opposed to the present plan and will vigorously oppose it when and if it comes before the Congress for consideration.

+=+=+=+=+=+=+

When, as at Thanksgiving, we pause in our busy lives to count our many blessings, it's good to know that people throughout the ages have felt the need to express their awareness of the benevolence of a Higher Authority. In keeping with the season, I want to share with you here a refreshing page from Flick's History of our State:

While the British and Dutch pioneers of our region retained many of the essential elements of Old World culture, nevertheless they gradually assimilated many New World ways and ideals. This was a natural reaction to the new environment and a logical adjustment to the new conditions, people and problems that confronted them. The Indian had contributed a number of things that made necessary a new group of concepts. The cultivation of maize, for example, was one agricultural trait borrowed in its entirety and taken over without modification. Corn (maize) was the Indian's particular grain, growing nowhere else in the world save America. It had been developed here by deliberate breeding, for it cannot grow in a wild state. From the first variety more than twenty had been evolved, each suited to some particular purpose. To the colonist, this grain was of the utmost importance, and every detail of the red man's method of cultivation was imitated. Corn was planted in rows, so many in a hill and the hills spaced a "long step" apart. There were three hoeings; harvesting by plucking the ears and braiding the husks together; placing the seed corn outside to endure the winter cold; corncribs; and scarecrows. Corn culture, borrowed from the Indian, brought about a whole set of new culture traits for the white man. We have not modified that method to this day, though we have machinery to lessen the work. Out of corn culture came many of our harvest customs such as the husking bee, the joke of the red ear, popcorn parties, green corn picnics, and the use of corn shocks and pumpkins for Thanksgiving decorations. Perhaps, too, some of our Thanksgiving customs were suggested by our red predecessors, for the Indians were very particular about their Thanksgiving season, having the sermons of their preachers, the chants of their ritualists and a general season of jollification after the more formal religious exercises. The Thanksgiving season of the New England Algonkian people was topped off with turkey and cranberries, both long-used American dishes. With the Iroquois there were six thanksgivings, all with dancing and feasts.

MEDICARE COSTS SOAR

The Federal Government's Medicare Program has cost $3.2 billion for its first year of operation, compared to the estimate of $2 billion given by the Johnson Administration when it was pushing it through Congress.

A family man with 2 children must today earn $13,234 a year to equal the 1939 purchasing power of $5,000.

CASUALTIES IN POVERTY WAR

The Poverty Bill passed the House of Representatives this past week. Its passage came after two full weeks of general debate and discussion of amendments. There are several points I should like to make clear:

I have said many times that it would be a tragedy for this country to abandon a war on poverty, but that the present program desperately needed redirection so that we could more effectively and realistically reach the poor who need our help in helping themselves. The bill before the House failed to make significant and creative improvement to get more money to the poor and eliminate the waste. All attempts to improve the program were rejected, largely on partisan lines. The bill passed the House 283 to 129. I voted "no" as a protest against the stubborn refusal to begin to make meaningful changes in the War on Poverty. Actually, the bill that passed the House is worse than present law in my opinion.

Throughout the long hearings and the consideration of the measure on the Floor of the House, I also fought to keep the issue from being one of money alone. The Administration had proposed that $2.06 Billion be spent this year on poverty. This figure was $400 Million higher than last year. The final House-approved figure last week -- after Republican amendments -- was $1.6 Billion. After the House-Senate Conference, the total will be somewhere near $1.9 Billion.

If money alone were not the issue, why did I offer an amendment to cut the authorization to $1.4 Billion? It was my intention to offer the "Opportunity Crusade", a new and far-reaching approach to the War, as a substitute for the Administration bill. The Opportunity Crusade would have generated and funneled more money directly to the poor, totalling approximately $3 Billion. The Federal share would have been $1.4 Billion. The "money question" came first, under the parliamentary procedure we followed, and the dollar figure had to be set.

ALLIES IN THE POVERTY WAR. Youthful Congressman Bill Steiger of Wisconsin, at 29 the youngest Republican in the House of Representatives, has been a powerful and effective debater during consideration of legislation extending the War on Poverty. We fought hard together for changes and improvements to make that war more successful.

=++=++=++=++=++=++=++=++=

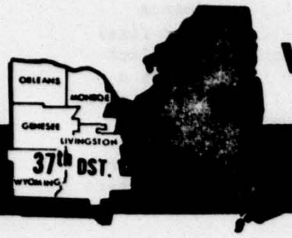
In the past few years, I have visited almost every major ghetto and poverty area in the United States. As contrasted with many parts of the country, our own area programs in the 38th Congressional District have been fortunate in having generally successful and sensible administration. For that reason the cuts I advocated were selective and would not have curtailed any funds to those operations. The administration of this program, on the whole, has been a chaotic mess. The Administration has created a massive wad of paperwork that too often soaks up the poverty money before it can ever reach the poor. High salaries for paper massaging have been prevalent throughout the country. Jobs for the unemployed frequently have not been emphasized at all. For that reason I proposed an Industry Youth Corps so that good paying jobs in private enterprise, with solid job training, could be provided rather than dead-end "make work".

The bill that passed the House has shortchanged the poor and eliminated true involvement of the poor themselves on the independent Community Action Boards. My amendment to reverse this situation -- to give the poor some part in their own destiny -- failed.

In the long run I am hopeful that the Poverty Program can be developed on a bipartisan basis and that Congress can redirect it so that the American people can have confidence in it. Then, and only then, can we get the full use of more funds for a real crusade or war against poverty in this country.

Sincerely,

Charlie Goodell



WASHINGTON REPORT
from Your Congressman

BARBER B. CONABLE JR.

No. 90-19

November 15, 1967

Dear Friends:

A MIXED BAG OF MOTIVES - As I write this the House is a battlefield, halfway through the debate on the future of Sargent Shriver's Office of Economic Opportunity. There are many warriors and they are fighting many wars. We have the War on Poverty, and the War on the War on Poverty, and those who may not favor the War on Poverty themselves but want to make political charges about those who war on the War on Poverty. As you can imagine, the issue is in some doubt. As I peer through the smoke of battle I have been able to identify at least these groups:

1. The Committed and the Uncritical - Mostly liberals, this group is convinced that a separate agency to coo.dinate government activities aimed at the root causes of poverty, with a budget of at least $2 Billion, is making significant improvements in the lives of the poor. Since this group was dominant in the previous Congress, the legislative history of the OEO has been one of resistance to any change at all. These people feel their prestige is at stake and that they cannot admit that any improvement is necessary or possible.

2. The Hardened Antagonists - This group, skeptical at first and then angered at former Committee Chairman Powell's refusal to permit any discussion or investigation of widespread reports of waste, maladministration and the playing of politics, has fallen into a pattern of resistance which makes it difficult for them to concede there is anything good about the program. Completely revamp it or scuttle it, they say.

3. The Economizers - Our grave fiscal problems have created a group of Congressmen who are inclined to cut funds for everything, regardless of merit. There is also a group of selective economizers looking for things to cut, but making value judgments as well.

4. The Political Strategists - This is not a group, but a series of maneuvering groups. Included are disillusioned Democrats who have lost interest in the program and are opposing any compromise in the hope that Republicans in groups two and three will kill the bill, giving them what they hope will be a political issue more valuable next year than a limping and controversial program. Also included are "permanent minority" Republicans who ignore the need for trying to solve national problems and vote the economic prejudices of their districts. Then there are "me-too" Republicans who think the way to beat the Democrats is to out-promise them.

5. The Racists - Those who identify the poor as predominantly Negro (not true, although there is a higher percentage of poverty among the Negro 10 per cent of our population than among the white 90 per cent) and have their own unfortunate reasons for voting for or against the poverty program.

6. The Terrified - These people say, "We've got to do something or what will happen next summer?" They are somewhat balanced by those who say, "Whether it has any good in it or not, I'm not going to be blackmailed by violence."

In the area of urban unrest, the OEO has become a controversial symbol far beyond its actual importance in the total government effort (welfare, job-training, social security, education, minimum wage, etc.) against poverty. With this mixed bag of motives you will pardon me if I am unwilling to predict who will win the battle

EXHIBIT A30

over its extension, however, or for what reasons. With wide-ranging amendments to be offered, I am also unwilling to predict how I will vote myself when the final roll is called. Like most members, I find myself influenced by sometimes conflicting motivations, and I seek for myself the same balance I hope for the House as a whole. However tough the categories may sound, oversimplified as I have stated them, most Congressmen want to do the right thing as they see it. I trust we can work against either the cynical manipulation of or the callous disregard for the poor, who must be confused by the trumpeting of the charging political behemoths. As one of our newspapers said the other day, when elephants fight it is the grass that gets trampled.

IS THERE TIME? - The Senate Finance Committee has now brought out the Senate version of the Social Security bill, unencumbered by the kind of extraneous matter which I thought possible when I wrote the last issue of this newsletter. As expected, it makes many changes in the House version and in effect follows very closely the original Administration recommendations. Of paramount interest the Senate Committee favored a cash benefit boost totalling 20%, (the House figure was 12 1/2%) effective April 1, 1968, to be financed by a substantial payroll tax increase over the years, but not immediately. The 20% increase in benefits includes a 15% across the board increase, and a minimum payment of $70 instead of the $50 provided in the House bill. The financing arrangements provided by the Senate include an eventual combined payroll tax of 11.6% and an eventual tax base of $10,800 (as opposed to the present base of $6,600, and $7,600 in the House version).

There are many other liberalizing provisions in the Senate's bill, including a reduction in the age at which men can draw social security and a greater increase than in the House bill of the amount that can be earned without affecting payments. Chiropractors and optometrists would be included under Medicare. The roll-back of federal aid to Medicaid provided in the House bill was left substantially unchanged by the Senate. The so-called "coercive" controls imposed on welfare programs by the House were dropped by the Senate.

The Senate has not passed its bill yet, but substantial changes from the committee suggestions are not expected. Thereafter a Senate-House conference will have the monumental task of trying to resolve the differences between the two bills. With such a wide gap between the two it is not likely that the ultimate solution will be based upon simple compromise, or that it will come quickly. It is still possible that the conference may not be completed until the new session in January.

A WHITE ELEPHANT - The Portageville Dam, suggested by a coordinating committee of federal and state agencies after a five year study of the Genesee River Basin, would be the largest public works project our congressional district has ever undertaken. I personally think it would be a monument to folly, at least on the basis of the arguments adduced for it to date. Upstream from the Mt. Morris Dam which has never been full, the dam would therefore have no flood control value. To generate significant amounts of peaking power, water from the Mt. Morris Dam pool would have to be pumped during night hours back to the Portageville Dam, then released through turbines as needed during the peak demand hours of the day. Electric distributors in our area say they don't want this power.

The tubes connecting the two dams to permit all this interchange of water, if not an eyesore in the Letchworth gorge would certainly be expensive to install. Portageville and much valuable agricultural land to the south would be flooded by a lake whose surface would go up and down enough to expose unattractive mud flats, particularly in Allegany County. If the dam were built, a good deal of recreational land could be developed adjoining Letchworth Park, but that beautiful park itself has not yet been developed to its full potential, and both Wyoming and Allegany Counties already have substantial tracts of undeveloped recreational land in addition to Letchworth. The cost would be at least $100 Million, and who knows what it would cost by the time approval could be won in a fiscally pressed Congress?

Other parts of the joint study are possibilities, but I can find nothing desirable about the Portageville Dam. At least, in my constant worry about getting first things first in our national priorities, I have had little difficulty in putting this project in last place.

Sincerely,

Barber B. Conable, Jr.

Allegany County
BOARD of SUPERVISORS
Belmont, New York

BENSON L. SMITH, Chairman

MANLEY C. ACKERMAN, Clerk

October 25, 1967

TO: THE GENESEE RIVER BASIN COORDINATING COMMITTEE

SUBJECT: PUBLIC HEARING, OCTOBER 25, 1967, ON GENESEE RIVER BASIN COMPREHENSIVE STUDY

Gentlemen:

Certified copies of Resolution No. 85-67 entitled "Resolution Opposing Army Engineers' Plan for a Portageville Water Impoundment and Supporting U. S. Soil Conservation Plan for Several Water Impoundments on the Genesee River" which was adopted on October 9, 1967 by the Allegany County Board of Supervisors are hereby submitted to this hearing. In addition to the Resolution, the Allegany County Board of Supervisors has the following comments and recommendations with respect to the Genesee River Basin Comprehensive Study.

The Allegany County Board of Supervisors acknowledges the great value and importance of the extensive information on land and water resources which has been skillfully accumulated by the agencies which took part in the Genesee River Basin Comprehensive Study.

This Board highly favors further study of water impoundments on tributaries of the Genesee River within the County, particularly in those land areas which are now largely undeveloped and where water impoundments would stimulate economic activity and would provide protection against flood damage to existing property.

It is the Board's concerted opinion that the information presented in the study so far as it relates to the portion of the River Basin within Allegany County is not adequate to justify the committment of large sums of public monies for construction of major projects which are now thoughtfully opposed by a large segment of the County's people.

It is this Board's recommendation that the proposals for such projects which are now subject to well-founded controversy await the formation of a Regional Water Resources Planning and Development Board as requested of the New York State Water Resources Commission by Allegany County and other counties and to further await the preparation by such a Board of a comprehensive plan for the protection, conservation, development and beneficial use of water resources as provided in Section 436 of the New York State Conservation Law.

EXHIBIT A31

To: The Genesee River Basin Coordinating Committee, October 25, 1967

It is a further recommendation that those projects which are free of substantial controversy and which are revealed to be in the public interest receive prompt consideration.

It is further recommended that the following information on the proposed Portageville Dam be obtained to supplement the existing study:

A. A comparison of the estimated cost of the proposed dam and proposed electric peaking power facilities with the estimated cost of jet engine driven electric power peaking plants.

B. An evaluation of the effects on local and regional economy of the conversion of large areas of highly productive farm land to park land.

C. An evaluation of compatibility with the purposes of The Appalacian Regional Development Act of 1965 of the probable effects on regional economy of the proposed expansion of Letchworth State Park.

D. An evaluation of the cost of expanding the capacity of Letchworth State Park within its present boundaries to maximize its usefulness inasmuch as the report states that it is only 50% developed.

E. An estimate of the cost of the extension of Letchworth State Park as recommended by the Recreation Task Group so that a cost-benefit ratio can be determined for such extension.

F. A comparison of estimated cost and benefits of other major undeveloped recreational sites within the County with those of the proposed Letchworth Park extension.

G. A study of availability and suitability for public recreation of the 52,000 acres within Allegany County which are now owned by New York State.

The foregoing was prepared by Arthur E. Black, Consulting Engineer upon direction of the Planning Committee of the Board of Supervisors of Allegany County.

James A. Young, Jr.

James A. Young, Jr.
Chairman, Planning Committee
Allegany County Board of Supervisors

RESOLUTION NO. 85 - 67 (Amended)

TITLE: RESOLUTION OPPOSING ARMY ENGINEERS' PLAN FOR A PORTAGEVILLE WATER IMPOUNDMENT AND SUPPORTING U.S. SOIL CONSERVATION PLAN FOR SEVERAL WATER IMPOUNDMENTS ON THE GENESEE RIVER.

Offered by: Planning Committee

WHEREAS, a joint study conducted by the Corps of Army Engineers on the Genesee River Basin provided for a water impoundment in the vicinity of Portageville, and

WHEREAS, the above mentioned dam would take from a minimum of 9,600 to 21,000 acres depending upon which plan was adopted, and

WHEREAS, present State Law governing the appropriation of land by the Allegany State Park Commission does not preclude the expansion of this area by future appropriations except upon disapproval by the Governor, regardless of local recommendations or local disapproval, and

WHEREAS, the removal of this amount of land and the people and businesses involved would cause irreparable damage. The proposed dam would eliminate approximately $879,763.00 in assessments, excluding public utility assessments, from the Assessment Rolls of the Towns of Hume and Granger as well as Allegany County and the revenues and business generated by the construction of this dam will in no way replace the businesses and the people involved, and

WHEREAS, the present Letchworth Park has not contributed to any appreciable growth or stimulation to the economy of the villages and towns on its perimeter in the last fifteen years and thus provides conclusive evidence that the Portageville Project will not support the economy that it replaces, and

WHEREAS, the increasing cost of Medicaid, the economic pressures on wages, the increased cost of materials, the probable construction of a county infirmary, with no foreseeable increase in economic benefits to Allegany County, if any of the aforesaid plans are adopted, makes the ultimate loss of tax base unfeasible at this time, and

WHEREAS, the original interest and intent of the State Water Resources Commission was to control flooding and stream bank erosion in the Genesee Valley, and

WHEREAS, the Plan of the U.S. Soil Conservation Service was to control flooding and erosion by several smaller impoundments on tributaries of the Genesee River, and

(Cont'd. Page 2)

STATE OF NEW YORK
COUNTY OF ALLEGANY } ss.

I, MANLEY C. ACKERMAN, Clerk of the Board of Supervisors of Allegany County, do hereby certify that the above is a true and correct copy of a Resolution adopted by said Board on the 9th day of October 1967, and of the whole thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of said Board at Belmont, N. Y., this 25th day of October 1967.

M C Ackerman
Clerk, Board of Supervisors, Allegany County

Moved by Mr. Hale Seconded by Mr. Faber

VOTE: Acclamation ✓ ROLL: Ayes ____ Noes ____ Absent ____

DECLARED: Adopted ____ Lost ____ Approved: ____

RESOLUTION NO. 85 - 67 (Amended)

TITLE:

Page 2

Offered by: Planning Committee

WHEREAS, The Allegany County Planning Board feels the plan of the U.S. Soil Conservation Service would meet the primary need of flood control and stream bank erosion of the Genesee River as well as provide water oriented recreation that could be privately developed, and

WHEREAS, the plan proposed by the U.S. Soil Conservation Service would not cause economic obliteration of the prime farm land and supporting businesses in the Towns of Hume, Granger and Caneadea, now, therefore, be it

RESOLVED:

1. That this Board of Supervisors is opposed to any proposition involving a single water impoundment in the Portageville area.

2. That this Board of Supervisors is in favor of the U.S. Soil Conservation Plan of several smaller impoundments on the tributaries of the Genesee River.

3. That the Clerk of this Board is hereby directed to send copies of this resolution to Livingston County, Wyoming County, Genesee County, Monroe County, Congressman Charles E. Goodell, Congressman Barber Conable, Assemblyman Frank Walkley, Senator James Hastings, U.S. Senator Robert F. Kennedy and U.S. Senator Jacob K. Javits.

STATE OF NEW YORK
COUNTY OF ALLEGANY } ss.

I, MANLEY C. ACKERMAN, Clerk of the Board of Supervisors of Allegany County, do hereby certify that the above is a true and correct copy of a Resolution adopted by said Board on the ...... day of .... 19....., and of the whole thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed the seal of said Board at Belmont, N. Y., this ...... day of ...., 19......

Clerk, Board of Supervisors, Allegany County

Moved by Mr. ____________ **Seconded by Mr.** ____________

VOTE: Acclamation ______ **ROLL: Ayes** ______ **Noes** ______ **Absent** ______

DECLARED: Adopted ______ **Lost** ______ **Approved:** ____________

____

RESOLUTION NO. 67 - 132

By Mr. Oulton, Chairman of the Rules Committee:

WHEREAS, the proposed Basin Plan of the Genesee River formulated by the U. S. Army Corps of Engineers calls for the construction of a dam at Portageville, New York, and

WHEREAS, the water impoundment would remove from production 12,000 to 20,000 acres of land depending upon the plan adopted, and the removal of such an extensive area is not justified when considering the population growth and the possible food shortages of the future, and

WHEREAS, a minimum of $659,615 in assessments, including public utility assessments, would be removed from the tax rolls of the Town of Genesee Falls and the County of Wyoming, and such a reduction in assessment would cause a financial hardship to the area, and

WHEREAS, the present economy of the region of the water impoundment would be destroyed and that the proposed Portageville project would not support this present level of economy, and

WHEREAS, the dam and recreational facilities proposed would be a needless duplication of existing facilities, therefore

BE IT RESOLVED, that this Board of Supervisors oppose the construction of the dam at Portageville, and

BE IT FURTHER RESOLVED, that the Clerk of this Board be directed to send copies of this resolution to Livingston, Allegany, Genesee, and Monroe County Boards of Supervisors, Congressman Barber B. Conable, Congressman Charles E. Goodell, Assemblyman Frank Walkley, Assemblyman James Emery, Senator James Hastings, Senator Thomas McGowan, U. S. Senator Robert Kennedy, U. S. Senator Jacob Javits, and that two copies of this resolution be filed with the appropriate authorities at the public hearing of the

plan conducted by the Army Corps of Engineers at Mt. Morris, New York on October 25, 1967.

Carried: Ayes - 15 Noes - 1, Mr. Erhart Absent - 0

Wyoming County
BOARD OF SUPERVISORS
Warsaw, N. Y.

THIS IS TO CERTIFY that I, the undersigned Clerk of the Board of Supervisors of the County of Wyoming, have compared the foregoing copy of resolution with the original resolution now on file in the office and which was passed by the Board of Supervisors of the said County, on the 23 day of October, 1967, a majority of all the members elected to the Board voted in favor thereof, and that the same is a correct and true transcript of such original resolution and of the whole thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and the official seal of the Board of Supervisors, this 24 day of October 1967

Clerk of the Board of Supervisors.

BOARD OF SUPERVISORS

LIVINGSTON COUNTY

COURT HOUSE

GENESEO, NEW YORK

Office of Clerk
Phone: Geneseo 420

EDITH L. CAMPBELL
Clerk of Board

October 24, 1967

Col. A. L. Wright
District Engineer,
U. S. Corp of Army Engineers,
Foot of Bridge Street,
Buffalo, New York 14207

Dear Sir:

Enclosed herewith please find certified copies of the following resolutions as passed by the Livingston County Board of Supervisors at their meeting held on Monday, October 23, 1967:

Resolution No. 67-154 Opposing Army Engineers' Plan for a Portageville Water Impoundment

Resolution No. 67-155. Concerning Canaseraga Creek Flood Control Porject

Very truly yours,

Edith L. Campbell jf

EDITH L. CAMPBELL, Clerk

ELC:jf
Enc.

EXHIBIT A33

RESOLUTION NO. 67-154 OPPOSING ARMY ENGINEERS' PLAN FOR A PORTAGEVILLE WATER IMPOUNDMENT.

WHEREAS, a joint study conducted by the Corps of Army Engineers on the Genesee River Basin provided for a water impoundment in the vicinity of Portageville, and

WHEREAS, the above mentioned dam would take from a minimum of 9,600 to 21,000 acres depending upon which plan was adopted, and

WHEREAS, present State Law governing the appropriation of land by the Genesee State Park Commission does not preclude the expansion of this area by future appropriations except upon disapproval by the Governor, regardless of local recommendations or local disapproval, and

WHEREAS, the removal of this amount of land and the people and businesses involved would cause, irreparable damage. The proposed dam would eliminate approximately $200,000.00 in assessments, excluding public utility assessments, from the Assessment Rolls of the Town of Portage as well as Livingston County and the revenues and business generated by the construction of this dam will in no way replace the businesses and the people involved, and

WHEREAS, the present Letchworth Park has not contributed to any appreciable growth or stimulation to the economy of the villages and town on its perimeter in the last fifteen years and thus provides conclusive evidence that the Portageville Project will not support the economy that it replaces, and

WHEREAS, the increasing cost of Medicaid, the economic pressures on wages, the increased cost of materials, with no foreseeable increase in economic benefits to Livingston County, if any of the aforesaid plans are adopted, makes the ultimate loss of tax base unfeasible at this time, and

WHEREAS, the original interest and intent of the State Water Resources Commission was to control flooding and stream bank erosion in the Genesee Valley, and, now, therefore, be it

RESOLVED, that this Board of Supervisors is opposed to any proposition involving a single water impoundment in the Portageville area, and be it further

RESOLVED, that the Clerk of this Board is hereby directed to send copies of this resolution to Allegany County, Wyoming County, Genesee County, Monroe County, and to Congressman Charles E. Goodell, Congressman Barber Conable, Assemblyman James L. Emery, Senator Thomas McGowan, U.S. Senator Robert F. Kennedy and U.S. Senator Jacob K. Javits.

LIVINGSTON COUNTY
Board of Supervisors
GENESEO, N. Y.

This is to Certify that I, the undersigned, Clerk of the Board of Supervisors of the County of Livingston, have compared the foregoing copy of resolution with the original resolution now on file in this office and which was duly adopted by the Board of Supervisors of said County on the 23rd day of October, 1967 and that the same is a true and correct transcript of said resolution and of the whole thereof.

In Witness Whereof I have hereunto set my hand and the official seal of the Board of Supervisors of the County of Livingston, this 24th day of October 1967

Clerk of the Board.

NS

RESOLUTION NO. 67- 155 CONCERNING CANASERAGA CREEK FLOOD CONTROL PROJECT

WHEREAS the Livingston County Board of Supervisors wishes to express their support of the flood control project for the Canaseraga Creek area and,

WHEREAS property owners in the area of this project have expressed their objection to the Board of Supervisors for the construction of ponding areas in the project area, now, therefore, be it

RESOLVED that it is the desire of this Board that the Corps of Engineers know that we are favoring a flood control project in the Canaseraga Creek area but feel that based on the reports now available that further study should be made as to the justification of ponding areas which will greatly delete a considerable amount of productive land from production.

Dated at Geneseo, New York

October 23, 1967.

Andrew G. Macauley
ANDREW G. MACAULEY, Chairman

Raymond Kiehle
RAYMOND KIEHLE,

Soil Conservation Committee.

Carl H. Roeser
CARL H. ROESER, Chairman

John A. De Leeuw
JOHN A. DE LEEUW,

Clarence Gibson
CLARENCE GIBSON,

Legislative & Public Relations Committee

LIVINGSTON COUNTY
Board of Supervisors
GENESEO, N. Y.

This is to Certify that I, the undersigned, Clerk of the Board of Supervisors of the County of Livingston, have compared the foregoing copy of resolution with the original resolution now on file in this office and which was duly adopted by the Board of Supervisors of said County on the 23rd day of October, 19 67 and that the same is a true and correct transcript of said resolution and of the whole thereof.

In Witness Whereof I have hereunto set my hand and the official seal of the Board of Supervisors of the County of Livingston, this 24th day of October, 19 67.

Clerk of the Board.

May 17, 1967

WATER RESOURCES COUNCIL

GUIDELINES FOR SUBMISSION AND REVIEW OF COORDINATED COMPREHENSIVE (TYPE 2) RIVER BASIN REPORTS

The Water Resources Council agrees to the distribution of the attached guidelines for use by Member agencies. These guidelines apply to the type 2 studies currently under way. Separate guidelines for submission and review of comprehensive regional framework studies (type 1) were issued on April 8, 1966.

These guidelines are for immediate use. Any comments, inquiries, or suggestions which you consider to be pertinent should be submitted to headquarters offices of each Department, agency, or bureau.

Hollis R. Williams
U. S. Department of Agriculture

for James J. Flannery
U. S. Department of the Interior

for Harry G. Woodbury, Jr.
Brigadier General
Department of the Army

George E. Tomlinson
Federal Power Commission

for Albert H. Stevenson
Department of Health, Education, and Welfare

Philip E. Franklin
Department of Transportation

Henry P. Caulfield, Jr.
Executive Director
Water Resources Council

ATTACHMENT 1

GUIDELINES FOR SUBMISSION AND REVIEW OF COORDINATED COMPREHENSIVE (TYPE 2) RIVER BASIN REPORTS

The procedures set forth herein are applicable to reports documenting the findings of coordinated comprehensive type 2 investigations and nothing in these procedures is to be construed as changing or otherwise affecting the procedures required by law or established practices for agency reports recommending authorization for construction. Modification of the procedures herein may be necessary for investigations accomplished under the direction of commissions established under Title II of the Water Resources Planning Act.

The comprehensive river basin planning program includes comprehensive detailed river basin investigations for basins in various regions of the United States. The findings of each of these investigations are to be recorded in a report summarizing the comprehensive basin plan and its alternatives and in a number of supporting appendices covering specific disciplines and features of the study. The report also will present procedures for implementing the plan and recommendations relative to the use of the plan as a guide to the development and use of the water and related land resources of the basin. It is expected that for many of these studies the principal or summarizing report and some appendices may be multiagency products. For example, to assure comparable consideration and treatment of all development potentials the detailed plan formulation study logically could be a multiagency accomplishment to be recorded in an appendix prepared jointly by the study participants, or otherwise as agreed to by study participants. In any event, the summary report and appendices should serve as supporting documents for reports by participating agencies setting out those portions of the comprehensive basin plan that the agencies will carry out as a part of agency action programs and requesting authorizations needed for that purpose. In cases where two or more agencies agree to a unified report requesting authorizations, all structural measures and improvements recommended for authorization in such unified report will be treated in a consistent and comparable manner with respect to the scope of field investigations, design criteria, estimates of costs, assessments of benefits, system analyses, and other features.

Since the summary reports and appendices involve coordinated multiagency efforts and in view of the unique uses to be made of them, the Water Resources Council has established the following procedures for submission and review of coordinated detailed basin survey (type 2) reports which are scheduled to be completed during fiscal years 1967, 1968, and 1969.

(1) Field level review by study participants:

During the preparation of the summary report and appendices in draft form, the study participants will be given informal opportunities to comment on drafts as completed. These comments will be taken into account, by modifications or objective discussions, in the preparation of subsequent drafts. As completed, the final field versions of the report and appendices will be submitted, formally, to field representatives of participating Federal and State agencies for comment within a 45-day period after receipt of the summary report and all appendices. The field level comments will be bound with and be an integral part of the summary report or appropriate appendix but will not commit either the Federal agencies, bureaus, or offices, or the States with respect to later official comments.

(2) Submission of summary report and appendices:

a. Upon completion of the field level review, the Coordinating Committee, acting through its Chairman, will advise field representatives of participating Federal and State agencies that on a date agreed upon by the Committee, the summary report and appendices will be available to serve as supporting documents for agency authorization reports.

b. On the date the summary report and appendices are made available, the Chairman of the Coordinating Committee shall transmit an information copy (in quadruplicate) of the report and appendices to the Executive Director, Water Resources Council, together with a statement of concurrent related actions by participating agencies.

(3) Submission of reports through agency channels:

Field elements of the participating agencies may initiate, at the time the summary report and appendices are made available, concurrent parallel transmission of agency authorization reports, supported by the summary report and appendices, through normal agency channels for "in-house" processing and review as directed by the individual agencies. Field elements of agencies not initiating such authorization reports, may initiate, at that time, parallel transmission of the summary report and appendices through agency channels for internal processing and review. This latter procedure would not preclude preparation and processing of an authorization report at a later date.

(4) Reviews at Departmental level:

a. Upon completion of the in-house processing and review and at a date agreed upon by the Water Resources Council after due consideration and resolution of any points of conflict or divergent views, and not more than 90 days after receipt by the Water Resources Council of the information copy of the summary report and appendices, the Water Resources Council shall submit the report and appendices to interested State Governors and their official representatives and to interested Federal agencies, other than Water Resources Council Member Agencies, for official review and comments within 90 days. Copies of the report and appendices needed for this referral will be furnished by the field coordinating committee.

b. Concurrently with Water Resources Council referral to States and agencies, or at appropriate time subsequent to such referral, the responsible Federal agencies at Washington level shall refer their authorization reports to the interested States and agencies for official review and comment within 90 days with proper reference, in the latter referral, to the Water Resources Council referral of the summary report and appendices.

c. Not later than 90 days after referral of the report to States and agencies for comment, the Water Resources Council shall furnish copies of all comments received to Water Resources Council Member Agencies for information and consideration.

d. State and agency comments from both referrals will be reviewed, discussed, and reflected as appropriate in Departmental reports accompanying the authorization reports and copies of all comments will be made a part of the authorization reports of sponsoring agencies.

(5) Submission of the summary report and appendices to the President:

Upon receipt of all State and agency comments, the Water Resources Council may submit the summary report and appendices, together with copies of all comments, to the President with appropriate references to separately forwarded authorization reports. This Water Resources Council submission also may present recommendations as to the use

and application of the comprehensive plan set forth in the summary report and appendices, proposals for the publication of the report and appendices, and recommendations regarding referral of the report to the Congress for consideration and guidance.

(6) Referral of authorization reports to Water Resources Council and Bureau of the Budget:

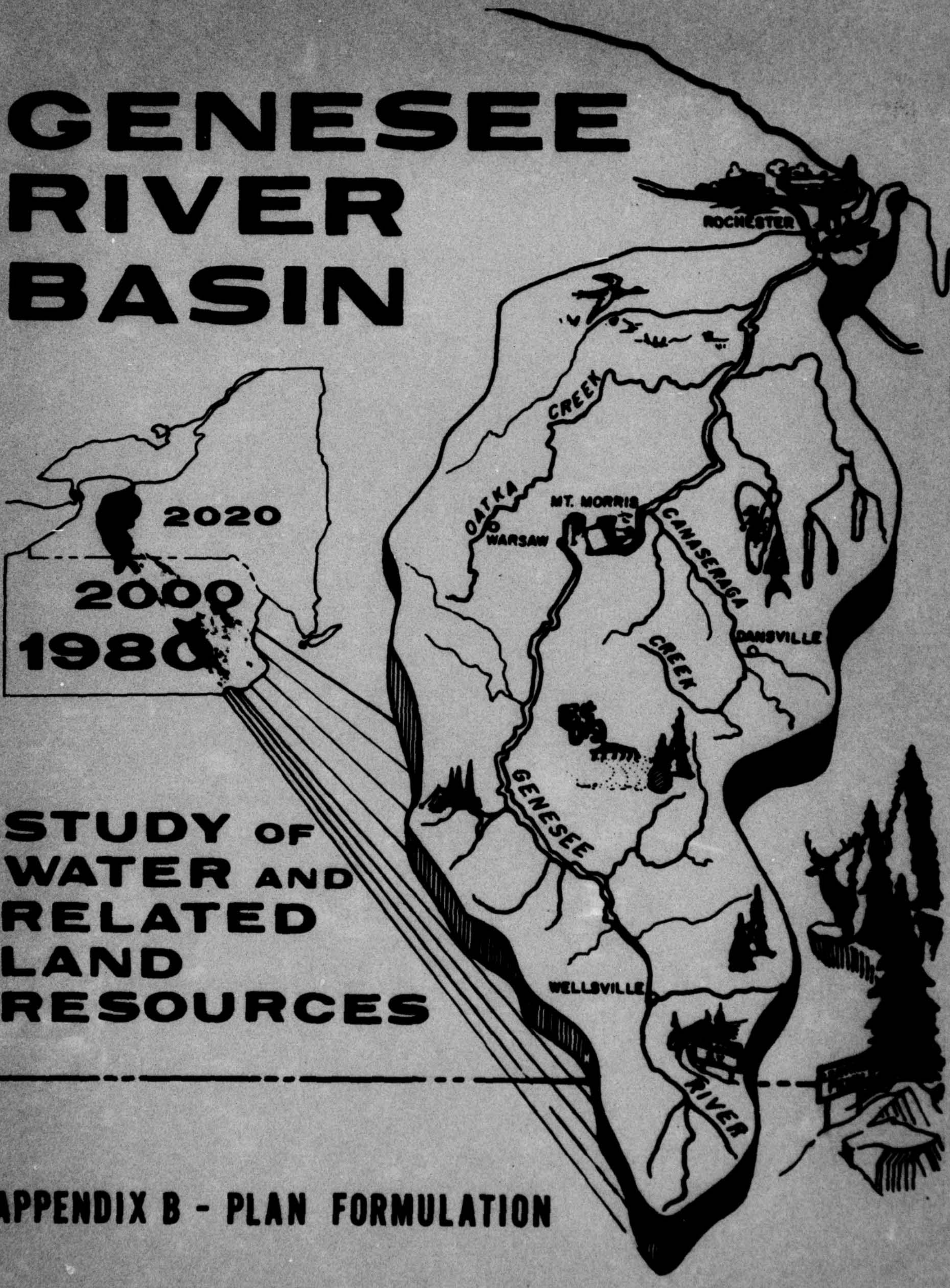
a. Authorization reports as finalized by the sponsoring agencies, together with the supporting summary report and appendices, State and agency comments and pertinent agency reports and papers, will be referred at Departmental level to the Water Resources Council for determination of the relationship of the proposal therein to the comprehensive basin plan for the basin with due consideration of comments and recommendations of reviewing States and agencies.

b. Following receipt of the Water Resources Council comments the authorization reports with supporting papers and the Water Resources Council comments will be referred by the sponsoring agencies to the Bureau of the Budget for determination of the relationship of the proposal therein to the program of the President.

(7) Submission of authorization reports to the Congress:

Upon receipt of Bureau of the Budget comments, authorization reports, together with all allied papers and comments, will be submitted to the Congress by the sponsoring agencies in accordance with established channels and procedures for such submission.

GENESEE RIVER BASIN



STUDY OF WATER AND RELATED LAND RESOURCES

APPENDIX B - PLAN FORMULATION

GENESEE RIVER BASIN

COMPREHENSIVE

STUDY OF

WATER AND RELATED LAND RESOURCES

APPENDIX B - PLAN FORMULATION

Prepared by
U. S. Army Engineer District, Buffalo
Corps of Engineers
Buffalo, New York 14207
September 1967

GENESEE RIVER BASIN COMPREHENSIVE STUDY

APPENDIX B

PLAN FORMULATION

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GENESEE RIVER BASIN COMPREHENSIVE STUDY

APPENDIX B - PLAN FORMULATION

SECTION I - GENERAL

INTRODUCTION

1. A comprehensive study for the Genesee River Basin was authorized by the Committee on Public Works of the United States Senate in a resolution adopted 1 February 1962. Scope and institutional framework for conduct of the study were made specific in the resolution which reads, in part:

> In making this study the Corps of Engineers shall coordinate fully with the State of New York and Commonwealth of Pennsylvania and other Federal agencies concerned to insure full consideration of all views and requirements of all inter-related programs, which those agencies may develop with respect to flood prevention, water supply, stream pollution abatement, recreation, fish and wildlife management, irrigation, soil conservation, hydro-electric power and related water and land resources.

To achieve the required interagency cooperation, the District Engineer, U. S. Army Engineer District, Buffalo, initiated formation of the Genesee River Basin Coordinating Committee. The District Engineer served as chairman and other members were designated by the Federal Departments of Interior, Agriculture, Commerce, Health, Education and Welfare, the Federal Power Commission and the State of New York and Commonwealth of Pennsylvania. Further details concerning the Committee and its functions are given in Appendix A, History.

OBJECTIVES AND CRITERIA

2. The Plan of Survey, prepared by the Corps of Engineers in cooperation with all participating agencies, contains statements of planning policies and procedures, applicable constraints and controls, technical studies required, schedules, responsibilities and work outlines of cooperating agencies, and the following two major objectives for the study. First, the report is to identify and evaluate in sufficient detail for authorization, any Federal or Federally-assisted projects or programs meeting needs of such immediacy that construction should be initiated within 10 to 15 years after report completion. Second, the report will

present a broad, long-range plan to assure best use of basin resources in meeting projected water-related needs through the year 2020. Furthermore, studies of any plan of improvement were to be terminated as soon as it could be established that plan justification would not result. Justification of any project would be required to satisfy criteria stated in the Plan of Survey as follows:

(1) Tangible benefits exceed project economic costs;

(2) Each separable unit or purpose provides benefits at least equal to its costs;

(3) The scope of development is such as to provide the maximum net benefits;

(4) There is no more economical means, evaluated on a comparable basis, of accomplishing the same purpose or purposes which would be precluded from development if the plan were undertaken;

(5) Where warranted, intangibles will be taken into account which might not otherwise be reflected in the tangible benefits and economic costs; and

(6) Federal participation will be recommended in accordance with applicable laws.

PLAN OF WORK

3. Technical studies for the report were conducted by task groups organized generally into resource fields such as flood control, recreation, power and so forth, and made up of participating agencies with special interest and capabilities in the various fields. A responsible agency was designated to provide leadership and prepare an appendix containing basic data, findings and recommendations of the task group. Special reports by individual agencies were included as attachments to appendices. The appendix on agriculture also contains sections on water supply, sediment and erosion, flood control and recreation to provide continuity and coherence in the development of plans for rural areas of the basin and to serve as a possible authorizing document for the Department of Agriculture.

4. The agencies cooperating in the work of each task group and further details concerning task group assignments are given in Appendix A, History. A list of appendices providing input data

for the determination of supply, demand, needs and problems within the respective resource fields follows:

Appendix C - Project Designs and Cost Estimates
Appendix D - Economic Base
Appendix E - Hydrology
Appendix F - Flood Control
Appendix H - Water Supply and Water Quality Management
Appendix I - Groundwater
Appendix J - Agriculture
Appendix K - Sedimentation
Appendix L - Hydroelectric Power
Appendix M - Recreation
Appendix N - Fish and Wildlife

Paragraphs in the following section consider each resource field in the order listed above for the contributing appendices.

GENESEE RIVER BASIN COMPREHENSIVE STUDY

APPENDIX B

SECTION II - DEMAND, SUPPLY AND NEEDS

ECONOMIC BASE

1. The Economic Base Study defines the area with close economic ties to the river basin and provides current and projected future population, employment and production indices for use by planning specialists in determining water and water-related resource needs and opportunities for development. The basic economic area and subarea divisions are shown on plate B-1. Consideration of specific activities showed that the basic area should be modified based on information obtained as the study progressed. The recreation market area, for example, was found to include counties to the south and west of the economic base area. The area of influence for fish and wildlife purposes and for one agricultural service area were also redefined. Limits of special study areas are included on plate B-1.

2. Dominance of the Rochester metropolitan area in population, employment, income, industrial production and even in certain sectors of the agricultural economy, is the most significant factor in the basin's economic base. Present trends indicate that the metropolitan area will closely parallel national growth and that the Central Plains and Allegany Plateau subareas will continue to lag. Historic and projected population and employment figures for economic subareas from the year 1940 to 2020 as shown on figure B-1.

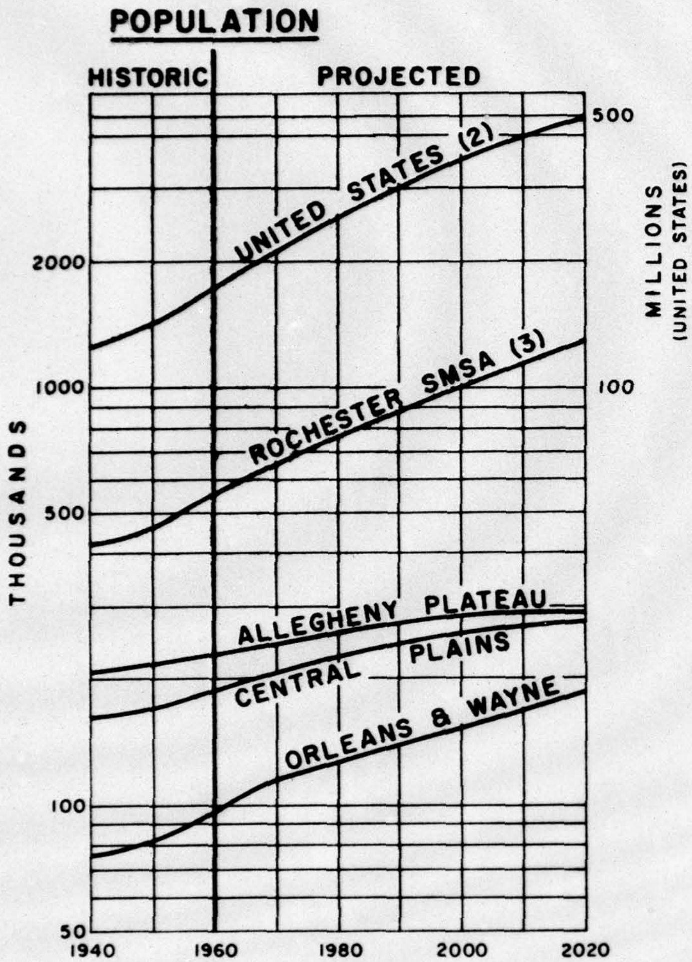
FLOOD CONTROL

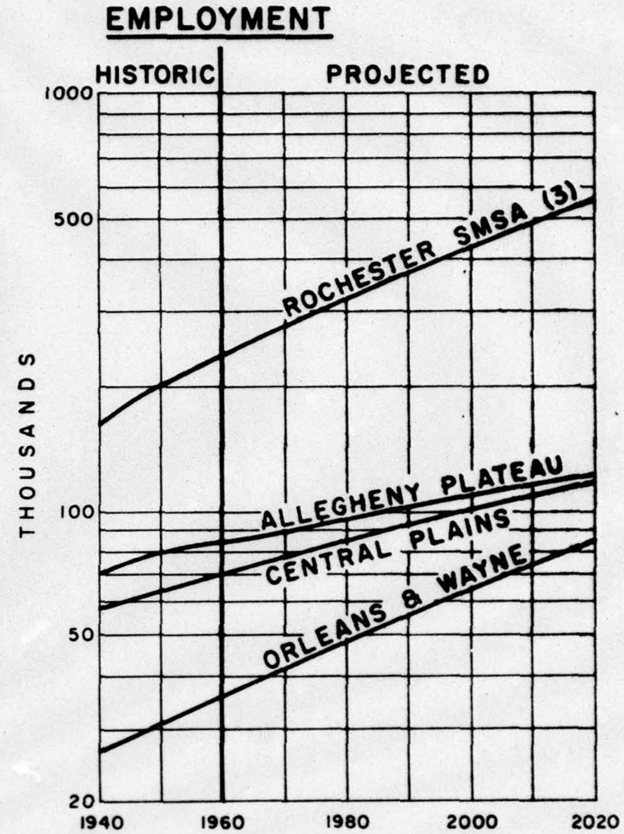
3. Locations of affected reaches and estimates of annual damages from flooding in the basin are contained in Appendix F, Flood Control, with supporting technical data in Appendix E, Hydrology. Flooding along upper basin tributaries, i.e., those upstream from Mt. Morris Dam is evaluated in Appendix J, Agriculture. Bank Erosion is considered in Appendix K, Sedimentation. Major problem areas cited in succeeding paragraphs can be located on plate B-2.

4. Genesee River flood damage is highest in the area from the New York State Barge Canal southward to the Village of Avon. This area, and the City of Rochester were vulnerable to much more severe and frequent flooding before Mt. Morris Dam went into operation in 1951, controlling about 44 percent of the river watershed. Damage along the river upstream from Mt. Morris Dam involves agricultural and pasture lands, scattered residential and farm buildings, roads and bridges. Intense localized damage occurs only at the village of Wellsville in the vicinity of the confluence of Dyke Creek and the river.

5. Flooding on the basin tributaries affects primarily agricultural lands and farm buildings although higher concentrations of damage are found in certain areas. The lower reaches of Canaseraga Creek, for example, constitute a rich agricultural valley which is inundated almost annually. Red Creek, in rapidly-developing suburbs near Rochester, experiences flooding both from the river and from its own drainage area. Oatka Creek is subject to flooding within the village of Warsaw. These locations and remaining reaches sustaining damage are included in table B-1 following. Reaches are described in detail in Appendix F.

POPULATION AND EMPLOYMENT - ECONOMIC SUBAREAS[1]





FOOTNOTE:

(1) Basin population and employment from Appendix D Part I.

(2) National economic growth projection by the Economic Task Force of the Ad Hoc Water Resources Council Staff. (1963)

(3) Monroe County only.

FIGURE B1

Table B-1. Average annual flood damage

Main stem reach	Tributary reach	Avg. annual damage	Remarks
1. Rochester		5,000	(1)
2. Chili		-	
	Black Cr.	16,850	
	Red Cr.	26,300	(2)
3. Avon		5,750	
	Oatka Cr.	4,500	
	Oatka Cr. (Warsaw)	39,200	(3)
	Honeoye Cr.	3,000	
4. Geneseo		450	
	Conesus Lake	2,500	
	Keshequa Cr.	3,000	
	Canaseraga Cr.	64,650	(4)
5. Mt. Morris		-	(5)
6. Portageville		1,650	
	Wiscoy Cr.	3,000	
7. Fillmore		2,250	
8. Belfast		500	
	Angelica Cr.	7,800	
9. Belvidere		350	
	Van Campen Cr.	1,230	
10. Belmont		700	
11. Scio		5,300	
12. Wellsville		23,800	(6)
13. Stannards Cor.		2,400	
14. Shongo		2,450	
	Cryder Cr.	3,990	
15. Pennsylvania		-	(5)

(1) Left bank Genesee River only.
(2) Local protection project authorized 1966 - Senate Document No. 107, 89th Congress, 2nd Session.
(3) Construction local protection project initiated October 1966.
(4) Local protection project included in this report. Refer to Appendix C, Project Designs and Cost Estimates.
(5) No significant damages.
(6) Modification existing project - Design Memorandum for Rectification of Deficiencies in Completed Local Protection Project Wellsville, N.Y., April 1966.

WATER SUPPLY, GENERAL

6 . Basic data and analysis of present and expected future municipal and industrial water supply demands are given in Appendix H, Water Supply and Water Quality Management. Groundwater resources of the basin are analyzed in Appendix I, Groundwater. Mineral industry requirements are included in Part IV of Appendix D, Economic Base Study. Water supply for rural domestic, livestock, irrigation and other agricultural use is given in Appendix J, Agriculture.

MUNICIPAL AND INDUSTRIAL DEMAND

7. Review of the four economic subareas defined in the economic base study established that the basic divisions would be convenient for water supply study purposes. Except for the Rochester Metropolitan subarea which includes all of Monroe County, the studies included only communities partially or wholly within the Genesee River watershed. Orleans and Wayne Counties, predominantly agricultural and lying outside the watershed, were also omitted from consideration for municipal and industrial water. Population and water demand for 1965 and as estimated for future years 1980 and 2020 are shown in table B-2 and are discussed below by subareas.

8. ROCHESTER METROPOLITAN SUBAREA

About 95 percent of the population of Monroe County is served by public water supply systems and it is assumed that all will be so served by 1980. Since 1875, the city of Rochester has drawn from Canadice and Hemlock Lakes, located in the Central Plains subarea about 30 miles south of the city. Estimated dependable yield is 34 mgd. In 1954, a treatment plant of 36 mgd capacity went into operation using Lake Ontario water to supplement the Hemlock system in meeting average and peak demands for the city. Monroe County Water Authority, serving a small portion of the city and the rest of the county, began operation of a 32 mgd treatment plant at Lake Ontario in 1963. Plans are underway to increase capacity to 57 mgd and the ultimate capacity with existing intakes will be 100 mgd. The Authority is planning to construct another treatment plant on Lake Ontario near the eastern county boundary. Groundwater used for municipal supply totals about 0.1 mgd in the county. Industrial water supply was about 90 percent self-supplied in 1965. A principal user, Rochester Gas and Electric Corporation, has an intake of 158 mgd capacity which takes cooling water from Lake Ontario. The subarea appears committed to Lake Ontario for water and the supply is adequate in quality as well as in quantity.

TABLE B-2. Municipal and industrial water demand

Sub-area	Basin population	Served by PWS	Water demand MGD Non Ind.	Ind.	Total
		Year 1965			
Allegany Plateau (1)	35,800	18,100	1.9	0.6	2.5
Central Plains (2)	90,500	45,700	5.2	6.0	11.2
Rochester-Metro (3)	638,300	603,400	65.2	202.9	268.1
Total	764,600	667,200	72.3	209.5	281.8
		Year 1980			
Allegany Plateau	37,200	18,500	2.1	1.0	3.1
Central Plains	106,900	53,600	6.5	9.1	15.5
Rochester-Metro	799,700	799,700	89.4	237.6	327.0
Total	943,700	871,800	98.0	247.7	345.6
		Year 2020			
Allegany Plateau	40,600	19,800	2.5	1.4	3.9
Central Plains	153,800	74,100	9.4	13.3	22.6
Rochester-Metro	1,369,000	1,369,000	171.0	319.6	490.6
Total	1,563,400	1,462,900	182.9	334.3	517.1

Footnotes:

(1) Watershed portions of Allegany, Steuben and Potter (Pennsylvania) Counties.

(2) Watershed portions of Genesee, Wyoming, Livingston and Ontario Counties.

(3) Monroe County.

9 . CENTRAL PLAINS SUBAREA

The portion of the subarea within the Genesee watershed includes most of Livingston County, large portions of Genesee and Wyoming Counties, and a small part of Ontario County. Areas adjacent to Monroe County are increasingly affected by metropolitan Rochester and are becoming suburban in character. About 80 percent of the water supply for municipal use was obtained from surface water in 1960. As previously stated, Canadice and Hemlock Lakes have been used as a principal source for Rochester since 1875. Honeoye, Silver and Conesus Lakes also are in the subarea and although heavily developed for private cottage sites, have been classified for public water supply by the State of New York. Certain villages and hamlets have been supplied from Hemlock system supply lines and others are seeking to obtain services from this source. Groundwater for domestic use totaled about 1 mgd in 1965. Surface water of good quality is available to meet foreseeable needs of the subarea, although institutional arrangements for redistribution from existing sources may be difficult to evolve.

10. ALLEGANY PLATEAU SUBAREA

The small communities characteristic of the entire subarea draw almost exclusively on groundwater as the source of supply. Wellsville, New York, largest incorporated community in the area, takes water from the Genesee River, but is considering development of a groundwater source. Groundwater of good quality is readily available in valleys of the river and larger tributaries throughout the central and southern sections of the basin. Yields could be increased several times over present usage.

AGRICULTURAL WATER USE

11. Agriculture in the Genesee region of New York State has experienced an increasing predominance of milk, fruit and vegetable production after a long period of general farming from the early years of the nineteenth century until about 1920. While the rural farm population, number of farms and acreage harvested have continually declined, the rural non-farm population has increased and total rural population has remained relatively constant in most areas. Economic subareas of the basin, as established in the Economic Base Study, were not fully adaptable for agricultural analysis. Therefore, land resource areas as delineated by the Soil Conservation Service, were used, and are shown on plate B-1. Land Resource Area 101, the Ontario Plain, includes that portion of the Genesee River watershed north of a generally east-west line through Mt. Morris Dam. The remainder of the watershed is in Land Resource Area 140, and is termed the Allegany Plateau. It includes the economic subarea of the same name and the southernmost portion of the Central Plains subarea. Water requirements for livestock and irrigation are summarized by land resource areas and rural domestic supply is summarized by economic subareas. An additional subarea, termed the Lake Ontario Lake Plain Service Area, and lying along the Lake Ontario shore between Lockport and Rochester, was included in irrigation studies.

12. RURAL DOMESTIC WATER SUPPLY

By agreement among participating agencies, rural users in Monroe County were included in the municipal and industrial water survey. Orleans and Cattaragus Counties were omitted from rural water supply inventories because of the small number of users involved. The rural population in the Genesee River watershed dependent upon individually-owned wells, springs or ponds and the water use in 1960 are given in table B-3 together with estimated future population and demand.

Table B-3. Rural domestic water demand

	1960		1980		2020	
	Population served	Annual demand million gallon	Population served	Annual demand million gallon	Population served	Annual demand million gallon
Central Plains subarea						
Genesee	9,760	164	14,000	349	24,200	1,203
Livingston	19,130	321	23,000	561	29,000	1,457
Ontario	3,750	60	6,200	154	15,000	730
Wyoming	7,120	120	7,600	188	8,500	422
Total	39,760	665	50,800	1,252	76,700	3,812
Allegany Plateau subarea						
Allegany	15,590	262	15,800	392	17,600	873
Steuben	1,970	33	2,000	50	2,000	100
Potter (Pa.)	1,450	24	5,700	142	7,600	377
Total	19,010	319	23,500	584	27,200	1,350

Local water sources are believed fully capable of meeting basin demands for rural domestic water supply. Individual well systems have proven unsatisfactory in certain localities such as Perry in Wyoming County, but organized water supply systems to develop available supplies would be sufficient to meet demands for such areas.

13. LIVESTOCK WATER REQUIREMENTS

Water used for livestock was most recently estimated for the entire basin for the year 1959 when about 1,165 million gallons were required. Projected demands for the two land resource areas of the basin are shown for two future years in table B-4.

Table B-4. Livestock water demand

Land resource area	1980	2020
	Annual demand in millions of gallons	
Ontario Plain	724	1,508
Allegany Plateau	693	1,113
Total	1,417	2,621

Future water needs for livestock are believed capable of being met by local sources.

14. IRRIGATION WATER FOR THE BASIN

Large scale supplemental irrigation of farm lands to improve quality of products and to increase yields is relatively new in New York State but accelerated in the two decades after 1940. Except for Allegany and Steuben Counties in New York and Potter County in Pennsylvania, this growth has been characteristic of the Genesee region with Monroe, Genesee and Livingston Counties leading in terms of acres irrigated. Because of urbanization, farm lands in Monroe County are decreasing and the rate of growth in irrigation has become slower than in the other two leading counties. Within the river basin, about 49,600 acres of farm land, generally located in small, scattered areas in northern subwatersheds are believed irrigable after provision of relatively minor drainage works. In 1964, about 5,200 acres were irrigated and the major source of water was natural stream flow. Estimated future annual water requirements for each of the basin's two land resource areas are summarized in table B-5. A deficit is shown for each period based on the assumption that acreage irrigated in 1964 represents the maximum that can be served adequately from existing sources.

Table B-5. Genesee River Basin
Future irrigation water demand

Land resource area	1970	1980	1990	2020
	acre-feet of water and acres irrigated (1)			
Ontario Plain	3,700	9,100	17,800	19,200
Allegany Plateau	2,100	5,400	10,800	10,700
Total required	5,800	14,500	28,600	29,900
Deficit	600	9,300	23,400	24,700

(1) Irrigation water for potatoes and vegetables based on 1/2 acre-foot per acre on the land, plus an equal amount in storage, transportation and distribution losses.

15. IRRIGATION ON THE ONTARIO LAKE PLAIN

The Ontario Lake Plain Service Area, although outside the Genesee River watershed, was included in Department of Agriculture studies because of proximity to the basin and because of the relationship between the river and the Barge Canal which cross at Rochester. The Service Area, as defined for this study, comprises 482,000 acres and land with soil types, slopes and drainage conditions adaptable to irrigation is estimated by the Department at about 183,000 acres and shown on Plate B-2. In 1959, 23,000 acres of vegetables were harvested of which 3,820 acres were irrigated. In 1964, irrigated acreage had risen to 5,450 acres and only a portion of the increase can be attributed to generally low rainfall in the period. Crops irrigated are primarily the major truck crops for which there is heavy demand and no national surplus. The Lake Plain is also noted for fruit production but the value of irrigating deep-rooted crops has not been established and was not further considered.

16. LAKE PLAIN IRRIGATION WATER DEMAND

Although growth has been rapid, acreage irrigated is a small percentage of total irrigable land, possibly due to the following factors: lack of sufficient quantities of water or uncertainty of future supplies, uncertainties as to technology or possible benefits, lack of capital and management skill, scarcity of labor, and institutional restrictions related to riparian or other water rights. These factors would also be relevant to other potentially irrigable land in the basin.

Table B-6 is a summary of projected irrigation water requirements on the Lake Plain based on expected acreages of potatoes and vegetables, and assuming satisfactory resolution of deterrent factors. Deficits shown assume that 1964 acreage irrigated is about all that could be served from existing sources of supply.

Table B-6. Ontario Lake Plain Service Area
Future irrigation water demand

	1980	1990	2000	2020
	acre feet of water and acres irrigated(1)			
Total required	13,360	27,050	27,660	27,670
Deficit	7,910	21,600	22,210	22,220

(1) Irrigation water for vegetables based on 1/2 acre-foot per acre on the land plus an equal amount for storage, transportation and distribution losses.

WATER QUALITY

17. An inventory of waste treatment facilities and a sampling program were undertaken in 1964 by a Federal-State task group to establish treatment levels and the consequent water quality characteristics of the basin's lakes, streams and groundwater resources. Findings are reported in Appendix H, Water Supply and Water Quality Management; Appendix I, Groundwater; and Appendix J, Agriculture which includes data on effects of agricultural pesticides.

18. WASTE LOADS

Existing municipal sewage treatment facilities in the basin were found to provide generally inadequate treatment with about 49 percent reduction of biochemical oxygen demand (BOD) being effected by the 14 facilities operating in the basin. Significant amounts of wastes were also discharged to basin waters by 19 industrial establishments. Future waste loads for the years 1980 and 2020 were derived using population projections as a basis for estimating municipal wastes and projections of employment and water use per employee in water using industries for separately discharged industrial wastes. Total loads for the basin are summarized in table B-7.

Table B-7. Waste discharges, Genesee Basin

Type	1964-65 Effluent	1980 (1) Influent	1980 (1) Effluent	2020 (2) Influent	2020 (2) Effluent
	Daily waste load in lbs. of 5-day 20° C, BOD				
Municipal	14,500	30,000(3)	4,500	58,000(3)	5,800
Industrial	83,500	160,000	23,500	250,000	25,200
Total	98,000	190,000	28,000	308,000	31,000

(1) Based on 85-90 percent treatment efficiency.
(2) Based on 90 percent treatment efficiency
(3) Assuming total population in communities over 500 persons will be served by treatment.

Waste loads tabulated do not include overflows from combined sewer systems nor the relatively minor agricultural and other land sources that presently add to surface water pollution problems. Combined sewer overflows are a major source of pollution in the Rochester area but the city has reported that there are no overflows during dry weather periods. Waste discharges and agricultural land runoff are also sources of phosphate pollution contributing to excessive algae production in lakes and streams. About 356,000 pounds of soluble phosphates as phosphorus are discharged annually into Lake Ontario from the river basin.

19. CRITICAL STREAM REACHES

The main river receives about 90 percent of the total municipal and industrial waste loading in the basin with the remainder being discharged into the tributaries. Because of the characteristic low flows during summer and early fall months with consequent low assimilative capacities, waste loads are sufficient to cause serious pollution on the river and certain tributary streams. Most seriously affected reaches are the lower Genesee River in Rochester below the Eastman Kodak Company's discharges, the Genesee River below the Gates-Chili-Ogden sewage treatment plant, and the river below the combined Avon-Birdseye discharge. Two additional river reaches and 21 tributary reaches are seriously affected with present waste treatment levels. The locations of these critical stream reaches are shown on Plate B-2. Even with the assumption that treatment levels will have reached 85 to 90 percent efficiency by 1980, and 90 percent or better by 2020, the three river reaches and six of the tributary reaches will experience serious quality deficiencies. Data for these nine most critical reaches are shown in table B-8.

TABLE B-8. **Waste loads for critical reaches**[1]

Stream Sector	Min DO allowable mg/1	Year 1980 5-day BOD capacity[3]	Year 1980 in lbs. loading[2]	Year 1980 Projected DO mg/1	Year 2020 5-day BOD capacity[3]	Year 2020 in lbs. loading[2]	Year 2020 Projected DO mg/1
Genesee River							
Kodak	4.0	6,100	16,600	0.6	6,400	18,000	0.9
Gates-Chili-Ogden[7]	4.0	2,030	1,870	4.4	2,200	3,150	3.1
Avon[8]	4.0	2,800	3,460	3.2	2,900	3,380	3.4
Oatka Creek							
LeRoy	4.0	--[4]	145	---	---[4]	155	---
Warsaw	4.0	90	220	0.0	100	200	0.9
Honeoye Creek							
Honeoye Falls	4.0	35	90[5]	0.0	55	100[5]	0.0
Mill Creek							
Wayland	4.0	25	60	0.0	30	50	1.9
Silver Lake Outlet							
Perry	4.0	175	580[6]	0.0	200	580[6]	0.0
Wilkins Creek							
Livonia	4.0	15	35	1.2	15	40	2.5

1. Critical sectors are defined as those sectors in which the water quality goals will be contravened even *with secondary treatment.*
2. Treatment anticipated to be 85-90 percent in 1980; 90 percent or better in year 2020.
3. All capacities and projected DO's were calculated for the minimum 7 consecutive day, 1-in-10-year low flow and the high temperature of 25°C.
4. Capacity of stream in area downstream of LeRoy where flow reappears from underground passage - is three times anticipated loading.
5. Loading calculated assuming reduced operations of Dutch Hollow Creamery.
6. Based on assumption that Perry Knitting will experience normal growth.

The information in the following footnotes became available after the preparation of Appendix H, and the draft of this appendix.

7. Gates-Chili-Ogden- Recent studies of the Genesee River's capacity by the New York State Department of Health and FWPCA have indicated higher capacities are available. A combination of higher minimum average consecutive 7-day 1-in-10-year flows (as determined by the USGS) and higher assimilative rates now indicate that the capacity is more than double the original estimate, or about 5,400 lbs/day. However, a State sponsored comprehensive study of the sewage needs of Monroe County, has included the possibility of expanding the existing Gates-Chili-Ogden treatment plant to accomodate a population of greater than 300,000 P.E. If such a plan should be adopted the stream would be contravened unless advanced treatment (greater than 90 percent BOD removal) or flow augmentation were provided.
8. Avon - The USGS has recently determined that minimum average consecutive 7-day 1-in-10-year flow to be 100 cfs instead of the earlier estimate of 75 cfs. With this higher streamflow 90 percent treatment should be adequate at Avon.

20. QUALITY GOALS AND STANDARDS

Parameters investigated to establish quality characteristics of basin waters included dissolved oxygen, BOD, acidity, coliform bacteria, phosphates, turbidity, temperature, dissolved solids and color. Limiting criteria for all parameters are not established but the Genesee River, from the headwaters in Pennsylvania to the mouth at Lake Ontario, is an interstate stream and the State of New York has indicated that water quality criteria applicable under the Water Quality Act of 1965 will be adopted.[1] For purposes of the present study, a dissolved oxygen concentration of 4.0 milligrams per liter was used as the minimum acceptable for basin streams. Assuming waste loadings and treatment levels detailed above, this dissolved oxygen requirement could be met by exclusion or diversion of wastes, by advanced treatment of wastes, or by flow augmentation. Table B-9 shows requirements for advanced treatment, in terms of percent removal of BOD, if additional dilution water is not provided.

Table B-9. Advanced waste treatment needs

Stream Sector *	Year advanced treatment becomes necessary	% removal of BOD 1980	% removal of BOD 2020
Genesee River			
Kodak	1965	92	94
Gates-Chili-Ogden	1990	--	93
Avon	1990	--	91
Oatka Creek			
LeRoy			
Warsaw	1965 (92%)	94	95
Honeoye Creek			
Honeoye Falls	1965 (96%)	98	98
Mill Creek			
Wayland	1965 (93%)	94	95
Silver Lake Outlet			
Perry	1965 (93%)	96	96
Wilkins Creek			
Livonia	1965 (94%)	95	96

* See footnotes for table B-8.

1. The State of New York submitted before the deadline of June 30,1967, both their water quality criteria for the interstate waters or portions thereto within the State, and a plan for implementation and enforcement of the criteria. On August 7, 1967, after certain revisions were agreed upon, the criteria and plans submitted by the State of New York for the Genesee River Basin were approved by the Secretary of Interior as Federal Standards.

21. FLOW AUGMENTATION

Improved water quality for the river basin is generally within the limits of present technology. Reduction of nutrients, especially phosphates, is an immediate need and treatment of all municipal and industrial wastes should be required. Secondary treatment (85 to 90 percent removal of BOD) is a necessary and minimum prerequisite to be used in conjunction with other control measures. Assuming that waste treatment to 85 percent efficiency will be provided through the year 1980, and that 90 percent will be reached thereafter, average monthly stream flows needed to meet gross dilution requirements in critical stream reaches are given in table B-10.

AGRICULTURE

22. Resource needs for rural areas of the basin were studied by the Department of Agriculture and are presented in Appendix J. The Department cooperated in all task groups, and findings within the scope of appendices other than that on agriculture are included in the appropriate paragraphs on water supply, flood control, etc. Reference is also made to the section in Appendix J on plan formulation for upper watershed development. Needs not discussed elsewhere are major drainage and land treatment measures.

23. DRAINAGE

About 108,000 acres of land in the basin could be benefitted by drainage works. Small on-farm parcels are considered below under land treatment. Large areas which are also subject to flooding are found in the Canaseraga Valley below Dansville where 11,500 acres are used for nursery stock, specialty vegetables and field crops; Oatka Creek below Warsaw where 2,000 acres could be made more productive by drainage; and Black Creek (Monroe County) in the town of Chili where rapid urbanization would certainly replace present farm usage if the dominant flood problem could be corrected and adequate drainage be provided.

24. LAND TREATMENT

Projections of land use for the river basin indicate that, in the period from 1970 to 2020, cropland acreage will decline by about 21 percent; pasture lands will decline by about 22 percent; forest lands will increase by about 21 percent; lands in urban use will increase by nearly 92 percent; and the residual, or lands in other uses including idle land and recreational land, will increase by some 35 percent. The changing pattern of land use will require land treatment measures to reduce erosion, eliminate excessive water conditions, improve unfavorable

TABLE B-10. Gross stream flow requirements (cfs)

Stream sector	Year	D.O. goal mg/l	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average monthly flow
Genesees River	1965	4	130	130	160	180	340	530	660	630	630	440	260	160	360
Kodak	1980	4	200	200	230	270	510	800	980	940	940	660	390	240	530
	2020	4	180	180	210	250	490	780	970	930	930	640	380	220	510
Genesee River	1965	4	3	3	4	4	13	20	25	24	24	17	8	4	12
Gates-Chili-	1980	4	18	18	22	26	57	85	106	101	101	70	40	23	55
Ogden	2020	4	26	26	30	38	82	134	166	158	158	110	62	34	85
Genesee River	1965	4	20	20	25	29	53	69	81	81	81	57	37	23	48
Avon	1980	4	20	20	25	29	57	77	93	89	89	61	41	29	52
	2020	4	20	20	25	29	53	73	89	89	89	61	41	26	51
Oatka Creek	1965	4	.1	.1	.2	.4	1.9	2.5	3.3	1.9	1.7	.9	.4	.1	1.1
Warsaw	1980	4	.1	.1	.3	.5	2.2	2.9	3.9	2.2	2.0	1.0	.5	.1	1.3
	2020	4					1.1	2.0	2.8	1.3	.11	.3			.7
Honeoye Creek	1965	4	.8	.8	1.0	1.1	2.6	3.6	4.2	4.1	4.1	2.6	1.7	1.0	2.3
Honeoye Falls	1980	4	1.3	1.3	1.6	1.8	4.3	5.9	6.9	6.6	6.6	4.3	2.9	1.6	3.7
	2020	4	.9	.9	1.2	1.4	4.0	5.5	6.4	6.4	6.4	4.1	2.4	1.2	3.4
Mill Creek	1965	4					.4	.5	.6	.4	.3	.1			.2
Wayland	1980	4					.5	.6	.7	.5	.4	.2			.2
	2020	4					.2	.2	.3	.1	.1				.1
Silver Lake	1965	4	1.1	1.1	1.5	1.6	4.5	5.2	6.1	4.2	3.7	2.4	1.6	1.1	3.0
Outlet	1980	4	1.8	1.8	2.4	2.7	7.6	8.6	10.0	7.0	6.1	4.0	2.7	1.8	4.7
Perry	2020	4	1.1	1.2	1.8	1.9	6.2	7.2	8.1	5.9	5.1	3.1	1.9	1.2	3.7
Wilkins Creek	1965	4			.1	.1	.3	.4	.6	.6	.6	.3	.2	.1	.2
Livonia	1980	4			.1	.1	.4	.6	.9	.9	.7	.4	.2	.1	.4
	2020	4					.3	.5	.9	.7	.6	.3	.1		.3

Note: Treatment was considered 85-90% until 1980; 90% or better thereafter.
See footnotes for table B-8.

soil conditions and protect forest lands. Recommended measures such as contour cultivation, strip cropping, diversion terraces, drainage, and establishment and improvement of ground cover vegetation are considered further in Appendix J. Total basin acreages in cropland, pasture and forests in 1966 and acreages requiring land treatment are shown in table B-11.

Table B-11. Land treatment needs

County	Cropland		Pasture		Forest	
	Total acres	Acres needing treatment	Total acres	Acres needing treatment	Total acres	Acres needing treatment
Allegany	124,610	51,600	79,300	36,460	185,000	140,900
Cattaraugus	1,600	950	1,000	1,100	5,820	3,900
Genesee	64,810	36,960	22,300	8,350	21,380	9,700
Livingston	213,310	90,350	69,800	60,200	75,180	45,100
Monroe	61,810	40,760	10,200	9,590	15,800	8,900
Ontario	26,400	13,890	13,800	16,200	29,710	14,700
Orleans	600	300	250	40	370	-
Steuben	24,780	19,280	7,200	2,810	16,530	13,300
Wyoming	96,200	51,440	26,570	12,180	50,300	25,000
Potter (Pa.)	13,000	6,950	9,400	6,990	27,500	9,300
Basin totals	627,120	312,480	239,820	153,920	427,590	270,800

SEDIMENT AND EROSION

25. SEDIMENT DISCHARGES

Stream samples, field reconnaissance, aerial photographs and map studies were employed to define areas subject to excessive sheet and bank erosion and to provide data for reservoir sedimentation studies. Details are given in Appendix K, Sedimentation. The lower Genesee River delivers a heavy sediment load to Lake Ontario during high runoff periods and dredging by the Corps of Engineers to maintain navigation in Rochester Harbor involves removal of about 82,000 tons annually. Representative average annual sediment discharges at other locations on the basin are given in table B-12.

Table B-12. Sediment discharges at selected points

Station	Drainage area: sq. mi.	Number of measurements	Average annual sediment discharge tons/sq. mi./year
Genesee River at Scio, N.Y.	309	17	200
Genesee River at Portageville, N.Y.	982	22	600
Canaseraga Creek near Dansville, N.Y.	153	18	1,100
Genesee River at Avon, N.Y.	1,666	34	750
Oatka Creek at Warsaw, N.Y.	42	19	700
Oatka Creek at Garbut, N.Y.	208	21	75

26. EROSION

No critical areas of sheet erosion were found along the main stem of the river and the major source of sediment is from erosion of stream banks. In upland areas, sheet erosion is estimated to be about equal to channel erosion as a source of sediment, and while the basin as a whole is not severely affected by sheet or gully erosion, significant benefits could be realized by land treatment measures on abandoned farmlands reverting to forest, and by improved management of established forest lands. Stream bank erosion causes locally severe losses of cropland, roads and buildings but need for a major bank stabilization program is not indicated. Genesee River problem localities are found between Wellsville and Scio, and near the village of Belfast, Houghton and Fillmore, all in New York State.

POWER

27. Annual use of electric energy in the Genesee basin power market area nearly doubled in each of the two decades from 1940 to 1960 and this rate in increase is likely to be maintained through 1980. Estimates for the more distant future were derived using expected rates of growth for the nation as a whole. Estimates for the basin power market area are shown in table B-13.

Table B-13. Past and estimated future power requirements

Year	Energy million kwh	Peak demand thousand kw	Load factor percent
1940(1)	534	118	51.5
1960(1)	1,999	428	53.2
1980	6,550	1,310	57.1
2000	17,100	3,250	59.9
2020	33,500	6,150	62.0

(1) Actual requirements

Three private utilities and the Power Authority of the State of New York supply virtually all electric energy for the economic study area and are interconnected among themselves and neighboring utilities in a highly coordinated operating system. The basin potential for hydroelectric power generation is small, both in relation to total system capacity and peak demand. Future base load requirements are expected to be met primarily by nuclear or fossil-fueled steam-electric plants supplemented by energy imports from sources outside the basin area as at the present time. In terms of basin needs, any economical hydroelectric capacity in the range of capability of Genesee River projects could be expected to assist in meeting peak loads.

OUTDOOR RECREATION

28. AREA OF INFLUENCE

The task of evaluating existing and potential outdoor recreation in the Genesee River basin required, as an initial step, determination of the area which would contribute significant numbers of users and which also offers alternative opportunities for recreational use and development. Determining factors were origin-destination data for visitors to state parks in western New York, travel time and distance from major population centers in western and west-central New York, and the distribution of public recreation areas in the same portions of New York and in certain contiguous counties of northwestern Pennsylvania. The influence area so defined consisted of the subareas of the economic base study with additional counties as shown on plate B-1 and in table B-14. It is noted that

any point in the river basin can be reached within 2 hours driving time from population centers in the influence area. The table also includes 1960 and estimated future populations for the recreation subareas.

Table B-14. Recreation subareas and populations

Year	Metropolitan	Barge Canal	Central Plains	Allegany Plateau		Basin total
	Subarea					
	Counties comprising subareas					
	Erie (1)	Orleans	Genesee	Allegany	McKean (Pa.)(1)	
	Monroe	Wayne	Livingston	Cattaraugus	Potter (Pa.)	
	Niagara (1)		Ontario	Chatauqua(1)	Tioga (Pa.)(1)	
			Wyoming	Steuben	Warren (Pa.)(1)	
			Yates(1)			
	Subarea populations (2)					
1960	1,893,344	102,148	219,524	490,429		2,705,445
1980	2,614,700	130,000	272,900	605,500		3,623,100
2000	3,118,800	159,000	288,150	684,200		4,250,150
2020	3,834,000	190,300	379,900	763,600		5,167,800

(1) Counties not included in economic subareas.

(2) Figures taken from appendix M.

29. MARKET AREA DEMAND

Demand, as defined for recreation studies, is an individual's desire to participate in an outdoor recreation activity. The four key water-oriented recreational activities for which total market area demands were quantitatively estimated are boating, camping, picnicking and swimming. Participation rates, adapted from data contained in Study Reports 19 and 26 of the Outdoor Recreation Resources Review Commission (ORRRC), were applied to current and estimated future populations to obtain estimates of

demand, in activity days, by market area residents. Allowance was made for out-of-area recreational activity. Non-resident demand was based on current ratios of resident and non-resident attendance at area state parks adjusted by appropriate factors for each key activity. Total area demand in activity days was reduced to demand in recreation days for the summer season and for a typical summer Sunday. Total demand in recreation days for the Genesee River basin market area are shown in table B-15 below. Breakdown by key activities is shown on plate B-2. The task group report emphasizes that the key activities analyzed are intended to serve as indices of total demand for outdoor recreation. Quantification was not attempted for such activities as driving for pleasure, outdoor games, bicycling and so forth - some of which have higher participation rates than certain of the water-oriented key activities.

30. SUPPLY

Recreation resource supply was based primarily on an inventory of existing and programmed developments in terms of capacity to accommodate the four key activities. The inventory included supply from the private sector as well as publicly-administered lands and facilities. In projecting future supply, it was assumed that all existing and programmed public developments represented 1980 supply. Current private sector supply was assumed to be at least that to be available in 1980. For each of the periods to 2000 and to 2020, an increase of 25 percent was assumed for available supply. Ability of the total market area supply to satisfy activity days of demand for the four key activities was converted to recreation days and is shown with demand in table B-15 below.

31. NEEDS

Despite extensive areas of attractive and relatively undeveloped countryside, abundant rainfall, and substantial acreages of water surface in lakes within or contiguous to the market area, the opportunity for water-oriented general recreation falls far short of existing and estimated future demand. The differences in supply and demand by activity days for the four key activities were converted to recreation days and are shown in table B-15.

Table B-15. Market area demand, supply, and needs

Year	Summer season Demand	Summer season Supply	Summer season Needs	Typical summer Sunday Demand	Typical summer Sunday Supply	Typical summer Sunday Needs
	1,000 recreation days (1)					
1960	21,700	8,600	13,100	610	170	440
1980	40,250	26,300	13,950	1,230	630	600
2000	65,350	32,950	32,400	1,960	640	1,320
2020	91,650	41,160	50,490	2,720	630	2,090

(1) Rounded from figures in appendix M.

Resource requirements in terms of acres of land and water surface to meet estimated future needs were based on the four key activities for a typical summer Sunday. Additional allowances were made to provide opportunity for activities other than the four investigated in detail. Lands actually developed for specific uses in a management unit such as a park or recreation unit represent only a portion, generally about 15 percent, of the total land requirements for the unit. For 1980 requirements in the Genesee basin area of influence, the factor used was about 20 percent. Estimated total land and water surface acreages required for the market area are shown in table B-16.

Table B-16. Resource requirements, recreation market area

	1980 Land	1980 Water	2000 Land	2000 Water	2020 Land	2020 Water
Acres required	31,700	89,400	117,300	160,900	206,500	225,400

FISH AND WILDLIFE MANAGEMENT

32. FISH AND WILDLIFE SERVICE AREA

Field surveys, intended primarily to obtain data on actual fishing and hunting use made of the river basin's lands and waters, also disclosed that about 50 percent of the users came from the Buffalo metropolitan area in 1964. For this reason,

the influence area for fish and wildlife studies added Erie and Niagara Counties to the 11 counties included in the economic base study. The area of influence is shown on plate B-1. Total population and population 12 years of age and older in the influence area for 1960, and as estimated for two future dates, are shown in table B-17.

Table B-17. Fish and wildlife service area population (1)

	Actual	Projected	
	1960	1980	2020
Total population	2,430,000	3,160,000	4,620,000
Population 12 years and older	1,800,000	2,400,000	3,600,000

(1) Eleven-county fish and wildlife influence area as defined in appendix N.

33. FISHING DEMAND AND SUPPLY

Present and projected estimates of numbers of fishermen and participation rates were based on service area population, field surveys of use and data from the 1960 National Survey of Fishing and Hunting. Field data collected in 1964 showed that, of the 215,000 active fishermen in the service area, 80,000 fished in Genesee River basin waters for a total of about 370,000 man-days of use distributed by types of fishing as shown in table B-18.

Table B-18. Basin fisherman-days, 1964

	Trout	Warm-water
	Use in fisherman-days	
Stream fisheries (1)	47,200	4,200
Lake fisheries (2)	21,400	295,600
Basin totals	368,400	

(1) On 5,400 acres of water surface in 570 miles of streams.
(2) On 8,800 acres of water surface in 7 lakes.

The basin total represented nearly 5 days annually in the basin for each user or about one-quarter of total fishing activity by the 80,000 fishermen. If quality and quantity of fishing opportunity were to be sufficiently improved, users from metropolitan Buffalo would be expected to spend at least 10 days annually, and users from most of the rest of the service area at least 18 days annually in the basin. In addition, other persons in the area not presently fishing in the basin would be attracted to improved fisheries. This latent demand, estimated at 40,000 persons in 1960, would increase to about 90,000 persons in the year 2020. Estimates of fishing demand based on present participation rates and projected population growth, and estimates of total potential demand including gradual conversion of latent demand to active participation by straight line growth to the year 2020 are shown in table B-19.

Table B-19. Service area and basin fishing demand

	Actual:	Projected	
	1960	1980	2020
Service area		Numbers of fishermen	
Total fisherman (1)	215,000	275,000	400,000
Latent demand	240,000	330,000	500,000
Latent convertible to active demand(2)	0	165,000	500,000
Total, incl. activated latent demand	215,000	440,000	900,000
Fishing in Genesee River basin			
Total fishermen (1)	80,000	106,000	160,000
Latent demand	40,000	58,000	90,000
Latent convertible to active demand(2)	0	32,000	90,000
Total, incl. activated latent demand	80,000	138,000	250,000
		Use in fishermen days	
Annual use without latent demand(1)	370,000	490,000	740,000
Annual use with latent demand (2)	-	2,060,000	3,900,000

(1) Based on 1960 participation rates and future population growth.
(2) Assuming improved fishing opportunity.

In 1960, 570 miles of stream provided 5,400 acres of water surface and seven lakes provided 8,800 acres for a total of 14,200 acres of water surface in the basin. In that year, the basin fisheries afforded 370,000 fisherman-days of use. With improved public access to available waters, and increased fishery productivity through solution of low flow, pollution and insufficient fish habitat problems, the 1960 acreage could constitute a supply capable of supporting 715,000 fisherman-days by 1980 and 1,300,000 fisherman-days by the year 2020.

34. FISHERY RESOURCE NEEDS

Future increases in fishing demand can be met by increasing productivity and improving access to existing waters, and by creating additional impoundments. Pressure on the basins fisheries can be expected to increase through population growth alone, and an index of requirements would be fisherman-days per acre of water surface. To maintain the 1960 ratio of 26 fisherman-days per acre and assuming no activation of latent demand, the present 14,200 acres of surface would need to be increased to 18,800 acres by 1980 and to 28,400 acres by 2020. If basin waters could be brought to full productive capability, additional acreage requirements to accommodate total demand, including latent demand that would consequently be activated, would be 27,000 acres by 1980 and, through higher productivity, 24,800 acres in 2020. Data is summarized in table B-20.

Table B-20. Basin fishery requirements

	Actual 1960	Projected 1980	Projected 2020
Existing basin supply (acres of surface water)	14,200	14,200	14,200
Maximum capability of exist. fisheries (1)			
Use in fisherman-days	370,000	715,000	1,300,000
Fisherman-days per acre (exist. acreage)	26	50	100
Use, excluding latent demand (2):			
Number of fishermen	80,000	106,000	160,000
Use in fisherman-days	370,000	490,000	740,000
Fisherman-days per acre (exist. acreage)	26	34	52
Acres required at 1960 capability	14,200	18,800	28,400
Deficit in surface acres (3)	-	4,600	14,200
Use, including activated latent demand (1)			
Number of fishermen	80,000	138,000	250,000
Use in fisherman-days	370,000	2,060,000	3,900,000
Acres required at 1980 and 2020 capabilities	-	41,200	39,000
Deficit in surface acres (4)	-	27,000	24,800

(1) Assuming improved access and increased productivity.
(2) Based on 1960 participation rates and future population growth.
(3) With added fisheries having same average capability as 1960 waters.
(4) With added fisheries having 1980 and 2020 capabilities, respectively.

35. DEMAND ON WILDLIFE RESOURCE AND BASIN SUPPLY

The total number of hunters in the service area was about 160,000 in 1964, and about 60,000 hunted in the Genesee River watershed deriving 640,000 hunter-days of use distributed as shown in table B-21.

Table B-21. Estimated in-basin hunter use, 1964

Big game (1)	Small game: Birds	Small game: Mammals	Other
Use in Hunter-days			
174,000	155,000	187,000	124,000

(1) Primarily white-tailed deer.

As in the case of fishermen, about 50 percent of the hunters came from the Buffalo metropolitan area. However, these hunters were inclined to spend the majority of their annual hunting time in the Genesee basin. Also analogous to fishing use, comparison of hunting recreation with participation in other areas of the state and nation, indicates that there must be a considerable latent demand for hunting if available resource were sufficiently developed. Latent demand is estimated at 155,000 hunters for the service area at the present time, of which about 25,000 would be expected to hunt in the basin if attractive hunting opportunities were provided. Estimates of demand, with and without activation of the latent sector, are shown in table B-22.

36. WILDLIFE RESOURCE NEEDS

Overall, the basin's wildlife resources are currently providing fairly satisfactory levels of hunting. However, to maintain this level and reasonably satisfy future demand will require resolution of such problems as lack of public access, destruction or alteration of wildlife habitat, and deficiencies of waterfowl habitat. About seven percent of the northern half of the basin is in private, non-profit club, or family-type hunting preserves and, at present trends, about 40 percent of the basin area suitable for hunting will be in such use by the year 2020. Increased urban and rural development will further restrict the hunting area available to the public. Demands for non-consumptive uses (e.g., aesthetic & educational) are also increasing, and need consideration. Except for water fowl habitat needs, these problems are largely outside the scope of a water-related resource study but accelerated programs for acquisition, development and management of public hunting areas are evidently needed if the wildlife recreational potential of the watershed is to be realized.

Table B-22. Service area and basin hunting demand

	Actual: 1960	Projected 1980	Projected 2020
Service area		Numbers of hunters	
Total hunters (1)	160,000	230,000	290,000
Latent demand	155,000	180,000	320,000
Latent convertible to active demand (2)	0	80,000	320,000
Total, with activated latent demand	160,000	310,000	610,000
Hunting in Genesee River basin			
Total hunters (1)	60,000	78,000	117,000
Latent demand	25,000	34,000	63,000
Latent convertible to active demand (2)	0	20,000	63,000
Total, with activated latent demand	60,000	98,000	180,000
		Use in hunter-days	
Annual use without latent demand (1)	640,000	820,000	1,240,000
Annual use with latent demand (2)	-	1,079,000	1,985,000

(1) Based on 1960 participation rates and future population growth.
(2) Assuming improved hunting opportunity.

NAVIGATION

37. A deep draft commercial navigation channel for lake vessels is maintained by the Corps of Engineers in the lower three miles of the Genesee River for the Port of Rochester. The port facility serves about 300 ships annually and principal products involved are coal, salt and newsprint. The New York State Barge Canal crosses the Genesee River in the southern part of Rochester and a terminal is maintained on the river in the city. Commercial traffic has been declining on the canal in recent years and only 200,000 tons of freight were shipped by barge in the Rochester-Lockport section in 1965. Use of the canal by pleasure craft has increased by more than four times in the past 10 to 15 years, however. Because of the three falls on the river between canal pool and Lake Ontario, no connecting waterway has ever been seriously considered. Commercial navigation has not been considered as related to basin development in the present study.

SUMMARY OF NEEDS

38. In terms of existing supply, and existing and projected demands on water and water-related resources, Genesee River basin and service area needs capable of at least partial resolution by structural measures are greatest for general outdoor and fish and wildlife recreation, electric power generation, supplemental irrigation water, and stream pollution abatement. Also resolvable in some degree by structural measures but geographically widespread with limited possibilities for benefits from individual projects, are needs for control of sediment production and deposition, erosion of stream banks, agricultural and other lands, and flood control. Geographical distribution of the basin's resources and needs is shown on plate B-2. In the formulation process, projects and programs capable of meeting identified needs were analyzed for economic feasibility and comparative work in developing the basin's water resources.

GENESEE RIVER BASIN COMPREHENSIVE STUDY

APPENDIX B

SECTION III - MEANS OF SATISFYING NEEDS

MEASURES CONSIDERED

1. Reservoirs to be impounded by dams across the main river or tributaries were considered for providing needed acreages of water surfaces for general recreation and for fish and wildlife habitat and related recreational pursuits. Reservoirs were also considered as providing opportunities for conventional or pumped storage hydroelectric power development, releases of impounded waters in time of need for water quality improvement and irrigation, for control of flood flows, and for the relatively minor domestic water supply needs not expected to be met by existing sources. Other structural measures, considered for capability to meet needs in particular resource areas, included developments adjacent to existing waters for water-oriented recreation; waste treatment facilities (including possible advanced treatment works), or facilities for diversion of wastes to improve surface water quality; bank protection works or channel improvement projects for erosion control; and local protection works, channel improvement or flood-proofing structures for reduction of flood damages. Non-structural measures considered were increased public access or removal of restrictions on existing waters for general recreation, hunting and fishing; changed techniques in management of agricultural and forest lands, reforestation and associated land treatment measures; and flood plain zoning, flood warning and forecasting systems for flood damage reduction.

GENERAL PROCEDURE

2. Because of the study schedule and funding arrangements, preliminary analysis of potentially beneficial projects was initiated concurrently with studies for identifying and quantifying the basin's problems and needs. In cooperation with other agencies participating in the appropriate task groups, sites for potential reservoirs on the river and major tributaries were identified and studied by the Corps of Engineers. Upland reservoir sites were similarly investigated by the Soil Conservation Service, U. S. Department of Agriculture. Data from previous studies, and input supplied by other task groups as the study progressed, were used for initial screening of sites. In the screening process, sites with greatest potential for meeting indicated needs were selected for more detailed evaluation. Resource problems resolvable by means other than reservoir storage were identified and analyzed by the particular task groups concerned.

PRELIMINARY ANALYSIS - MAJOR RESERVOIRS

3. METHOD OF ANALYSIS

Map studies and field reconnaissance identified 14 major reservoir sites with potential for multiple-purpose use. Site locations are shown on figure B-2 and maximum available storages are shown graphically on figure B-3 along with costs per acre-foot. Project descriptions, design data and preliminary cost estimates are given in appendix C. Potential benefits, net of identifiable specific costs, were based on single-purpose development and were compared with project costs to determine which of the sites considered would warrant further study. The sum of benefits so derived would exceed total benefits which could be realized from multiple-purpose operation, but the larger figure served as an indicator of potential feasibility. Data from the preliminary analysis are summarized in table B-23.

TABLE B-23. Preliminary data summary - major reservoirs

No.	Site	Stream	D.A. (sq mi)	Max. dam hgt. (ft)	Storage capacity (1000 A-ft)		First costs ($1000)			Annual charges (1)		Potential average annual benefits ($1000) (2)							Total benefits ÷ annual costs
					Total	Active	Dam & reservoir	Real estate	Investment	Total ($1000)	$/A-ft	Flood control	Irrigation	Power	Water quality (3)	Outdoor recreation	Fish & Wildlife	Total	
1	Stannard	Genesee River	168	90	93.5	91.0	17,400	1,250	19,816	706.2	212	17.7	20.1	4.0	494.0	7.8	742.0	1,286.0	1.8
2	Chenunda	Chenunda Cr.	29	130	20.0	19.6	13,000	460	14,061	511.0	704	5.7	20.1	5.0	106.5	1.7	135.0	274.0	0.5
3	Vandermark	Vandermark Cr.	20	130	20.2	19.9	8,700	110	9,300	343.0	420	1.0	15.9	2.0	106.0	1.9	128.0	256.8	0.5
4	Angelica	Angelica Cr.	54	130	45.7	39.4	15,100	770	16,574	597.0	362	8.6	7.2	5.0	214.0	86.4	375.5	695.7	1.2
5	Summit	Black Creek	20	54	20.0	18.0	4,900	110	5,166	189.2	258	4.2	7.2	0	97.8	3.5	495.0	607.7	3.2
6	Belfast	Genesee R.	580	110	145.0	127.4	39,800	2,200	44,625	1,538.0	308	4.4	7.2	23.0	500.0	13.3	337.0	884.9	0.6
7	Cold	Cold Creek	40	140	23.8	23.1	14,500	230	15,650	565.7	658	0.5	4.8	6.0	125.4	3.0	138.0	277.7	0.5
8	Rush	Rush Creek	39	130	18.6	18.1	16,800	105	17,962	643.4	966	0.6	4.8	4.0	101.0	1.4	166.0	277.5	0.4
9	Wiscoy	Wiscoy Cr.	103	160	43.2	42.7	14,800	250	15,990	577.5	370	3.5	2.4	22.0	234.0	1.8	88.0	351.7	0.6
10	Portage	Genesee R.	985	130	283.0	251.0	23,100	5,300	30,919	1,057.0	109	0	0	1,280.0	500.0	818.0	629.0	3,233.0	3.1
11	Tuscarora	Kesnequa Cr.	68	145	46.0	43.7	8,300	550	9,265	343.5	201	2.6	0	7.0	237.0	63.4	346.0	656.0	1.9
12	Hogg's Hole	Canaseraga Cr.	69	210	56.0	53.0	30,000	215	32,103	1,122.0	573	9.0	6.9	26.0	287.5	--	196.0	525.4	0.5
13	Honeoye	Honeoye Cr.	189	70	13.6	12.8	8,300	250	8,951	331.0	658	--	12.3	0	69.5	6.7	--	88.5	0.3
14	Oatka	Oatka Creek	186	110	44.5	43.7	14,700	640	16,299	587.8	366	0.7	0	7.0	237.0	301.0	215.0	760.7	1.3

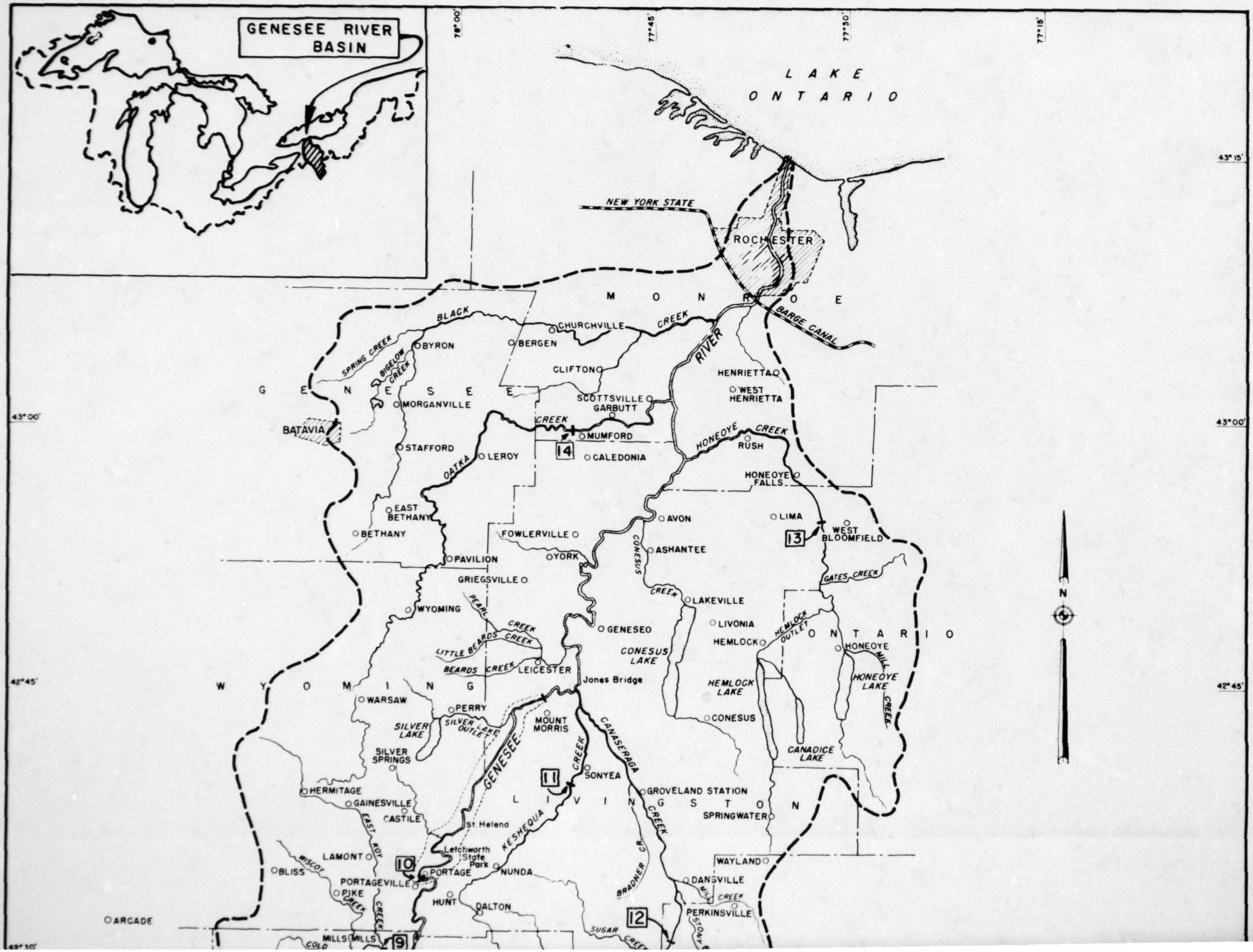
(1) Includes interest and amortization at 3-1/8 percent over 100-year period, engineering and design, supervision and administration, operation and maintenance.
(2) Maximum benefits, net of specific costs, obtained by single-purpose reservoir operations.
(3) Based on meeting portion of flow augmentation requirement for lower Genesee River below Court Street Dam in Rochester, and with total potential benefits limited to cost of alternative waste treatment facilities.

4. DISCUSSION

Potential flood control benefits were generally inconsequential, ranging downward from about 2-1/2 percent of annual cost for Stannard reservoir down to one percent and less at other sites. Power benefits tabulated were derived from on-site generation and the power inventory of appendix L established that benefits would not meet the test of comparison with the least-costly steam alternative except at the Portage site. Water quality benefits were based on prorated portions of the storage needed for the dilution requirements in the Genesee River downstream of Court Street dam at Rochester and, except for the Portage and Belfast sites, could be met only by combinations of two or more of the smaller sites. In any practical combinations, virtually all of the active storage in the smaller sites would be needed, substantially reducing possible benefits from other purposes. Potential irrigation benefits, like water quality benefits, were based on meeting requirements in common reaches and the sites would be competing on a cost per unit of storage basis. Water supply for municipal, industrial and rural domestic use was not considered in view of the determination by the responsible task group that sources other than reservoir's were adequate in quantity and quality and more likely to be developed to meet indicated future needs.

5. CONCLUSIONS

Selection of sites for more detailed study was based on indicated feasibility, ability to provide substantial benefits for more than a single project purpose, and economy per unit of storage. On this basis the five sites selected were Portage, Stannard, Tuscarora, Angelica and Belfast. The first three were selected primarily because feasibility as multiple-purpose sites was indicated. Angelica was selected for multiple-purpose potential and to resolve the marginal economic feasibility. Belfast was selected, despite indicated infeasibility, partly because of relatively low unit cost but primarily to have sound cost data should studies subsequent to the preliminary analysis reveal unforeseen needs for the large storage capacity available at the site. Summit site, with over 80 percent of total benefits from fish and wildlife enhancement possibilities, and Oatka site, with about 70 percent of total benefits in general recreation and fish and wildlife enhancement, were concluded to be best suited for single-purpose development. Further cost data were not requested for either of the two sites. Table B-24 summarizes conclusions drawn from the preliminary analysis of major reservoir sites.



GENESEE RIVER BASIN
LAKE ONTARIO
NEW YORK STATE
ROCHESTER
MONROE
BARGE CANAL
RIVER
BLACK CREEK
SPRING CREEK
BIGELOW CREEK
BYRON
BERGEN
CHURCHVILLE
CLIFTON
HENRIETTA
WEST HENRIETTA
GENESEE
MORGANVILLE
SCOTTSVILLE
GARBUTT
BATAVIA
STAFFORD
CREEK
MUMFORD
14
CALEDONIA
OATKA
LEROY
HONEOYE CREEK
RUSH
HONEOYE FALLS
EAST BETHANY
BETHANY
AVON
LIMA
13
WEST BLOOMFIELD
FOWLERVILLE
YORK
ASHANTEE
PAVILION
GRIEGSVILLE
CONESUS CREEK
LAKEVILLE
GATES CREEK
WYOMING
PEARL CREEK
GENESEO
LIVONIA
LITTLE BEARDS CREEK
HEMLOCK
HEMLOCK OUTLET
ONTARIO
HONEOYE
CONESUS LAKE
MILL CREEK
HONEOYE LAKE
BEARDS CREEK
LEICESTER
Jones Bridge
HEMLOCK LAKE
WYOMING
WARSAW
PERRY
SILVER LAKE
SILVER LAKE OUTLET
MOUNT MORRIS
CANASERAGA
CONESUS
SILVER SPRINGS
GENESEE
CANADICE LAKE
11
CREEK
SONYEA
HERMITAGE
LIVINGSTON
GROVELAND STATION
GAINESVILLE
SPRINGWATER
CASTILE
St. Helena
KESHEQUA
EAST KOY
Letchworth State Park
LAMONT
WISCOY
10
PORTAGE
NUNDA
BRADNER CR.
WAYLAND
BLISS
PORTAGEVILLE
DANSVILLE
PIKE CREEK
HUNT
DALTON
PERKINSVILLE
ARCADE
12
SUGAR CREEK
STONY
MILLS MILLS
9
COLD
78°00'
77°45'
77°30'
77°15'
43°15'
43°00'
42°45'
42°30'
N

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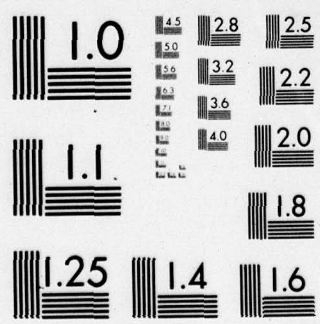
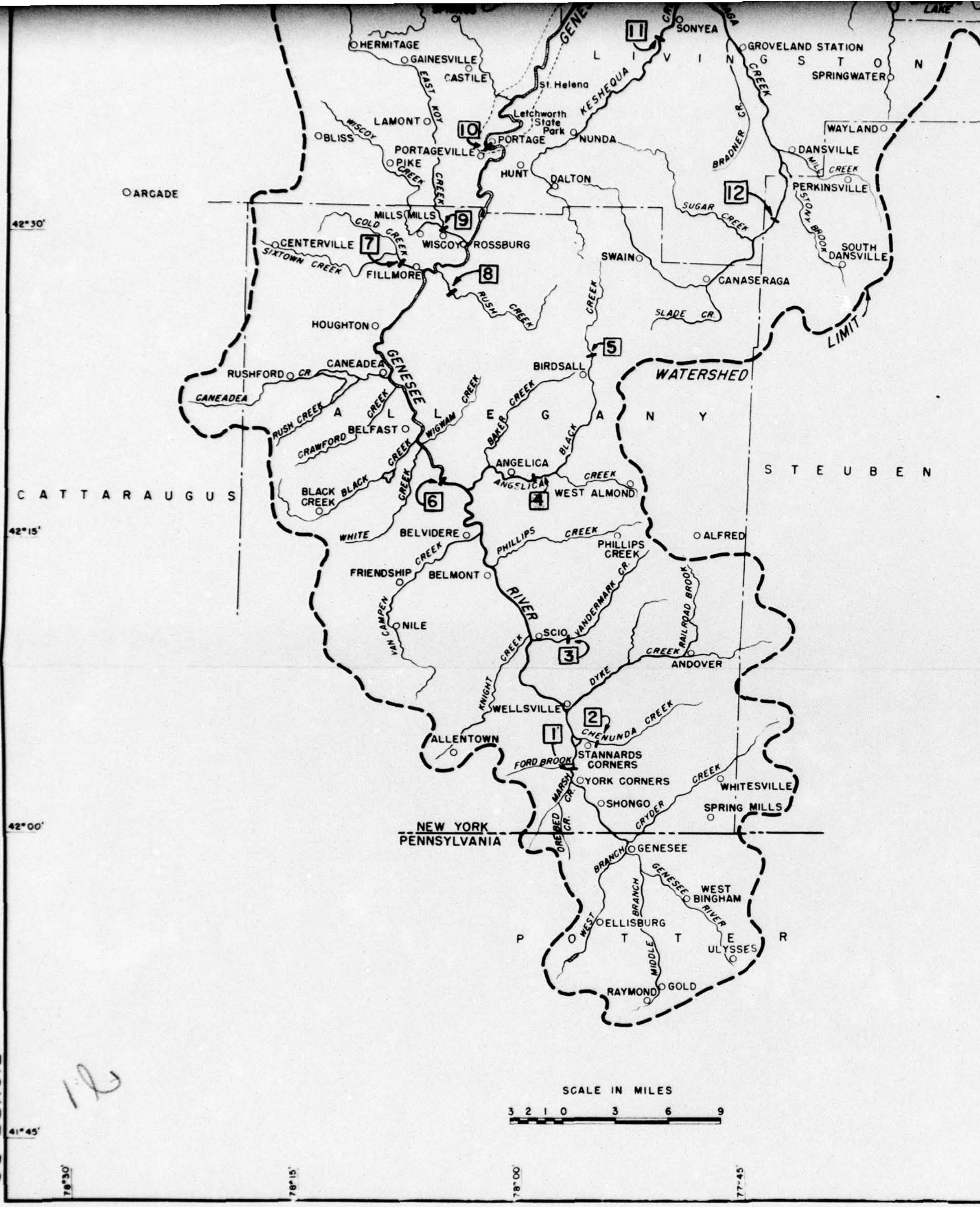


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



INDEX TO SITES

NO.	SITE	STREAM
1	STANNARD	GENESEE RIVER
2	STANNARD	CHENUNDA CREEK
3	VANDERMARK	VANDERMARK CREEK
4	ANGELICA	ANGELICA CREEK
5	SUMMIT	BLACK CREEK
6	BELFAST	GENESEE RIVER
7	COLD	COLD CREEK
8	RUSH	RUSH CREEK
9	WISCOY	WISCOY CREEK
10	PORTAGE	GENESEE RIVER
11	TUSCARORA	KESHEQUA CREEK
12	POAG'S HOLE	CANASERAGA
13	HONEOYE	HONEOYE CREEK
14	OATKA	OATKA CREEK

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

MAJOR RESERVOIR SITES STUDIED

U.S. ARMY ENGINEER DISTRICT, BUFFALO

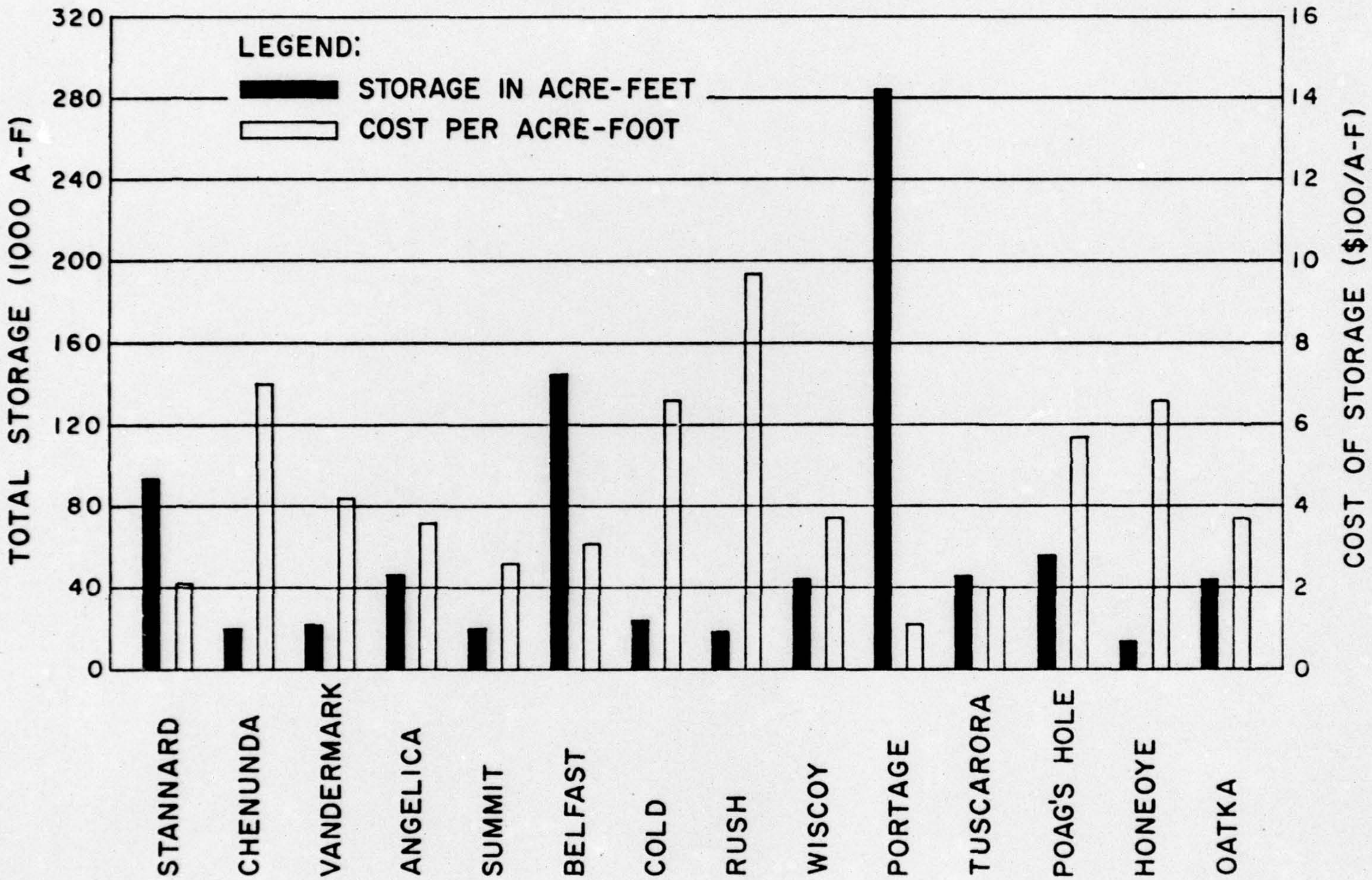
JUNE 1967

12

FIGURE B2

FIGURE B2

RESERVOIR STORAGE AND COST



NOTE: Costs are based on preliminary estimates for site screening.
Price level July 1965

FIGURE B3

TABLE B-24. Summary of analysis

Site	Multiple-purpose	Indicated feasibility	Potential purposes	Selected
Stannard	Yes	Yes	1. Fish and wildlife 2. Water quality 3. Irrigation 4. Flood control 5. General recreation	Yes
Angelica	Yes	Marginal	1. Fish and wildlife 2. Water quality 3. General recreation 4. Flood control	Yes
Summit	No	Yes	1. Fish and wildlife 2. General recreation	No (1)
Belfast	Yes	No	1. Water quality 2. Fish and wildlife 3. General recreation	Yes (2)
Portage	Yes	Yes	1. Power 2. General recreation 3. Fish and wildlife 4. Water quality	Yes
Tuscarora	Yes	Yes	1. Fish and wildlife 2. Water quality 3. General recreation	Yes
Oatka	No	Marginal	1. General recreation 2. Fish and wildlife	No (3)

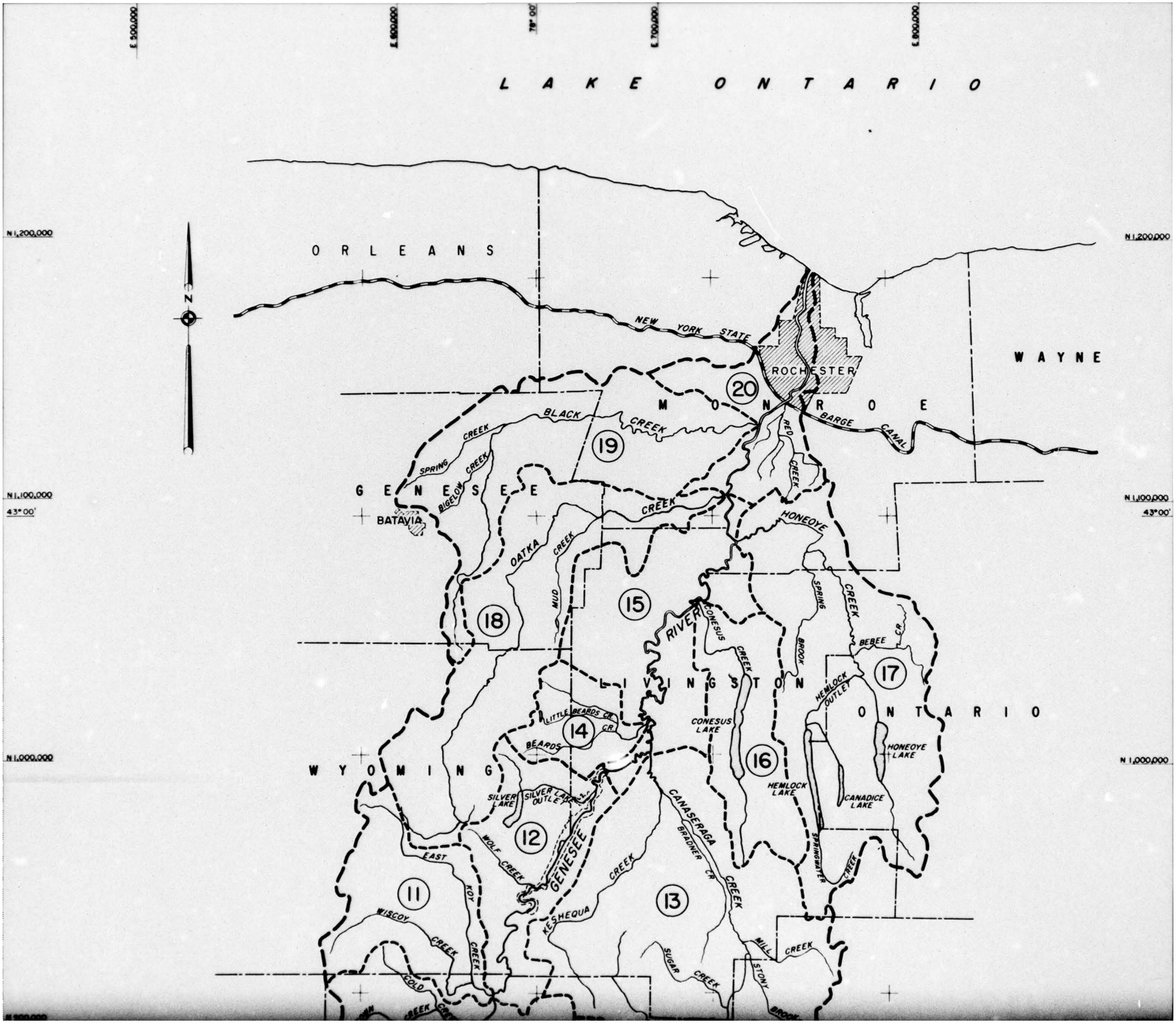
(1) Best use would be single-purpose fish and wildlife project.
(2) Included because of large storage capacity.
(3) Best use would be single-purpose general recreation, particularly because of proximity to Rochester metropolitan area.

PRELIMINARY ANALYSIS - UPLAND RESERVOIRS

6. The tentative formulation of a structural program for upland reservoirs by the United States Department of Agriculture was based on first, a study of potential structure site locations and second, selecting those structures which appeared feasible to meet preliminary needs and benefits determined by Task Groups No. 4, 8 and 9. These task groups represent the purposes of municipal and industrial water and low flow augmentation, recreation and fish and wildlife, respectively. Task Group No. 5 determined needs for irrigation and flood control.

7. METHOD OF ANALYSIS

The Genesee River Basin was divided into twenty watershed areas which are designated 1 through 20 and are shown on figure B-4. Base maps of the entire Genesee River Basin and each watershed were prepared from U. S. Geological Survey topographic maps to show the watershed boundary, drainage pattern, system of roads and other pertinent data. These maps are used to show site locations and are included in appendix J. Tentative locations were selected for 226 structures by a study of U. S. Geological Survey topographic maps and a field reconnaissance was made on each site. A final list of 95 sites was established for which design and cost data was developed. See table B-25. Detailed design and cost information for each site may be found in the attachment "Upland Reservoir Studies" to appendix J. Site screening and the resulting elimination of sites from further study was based on many factors. The factors included: potential needs, stage-storage-surface area relationship, required flood storage, topographic and geologic conditions, and apparent cost of land, roads, buildings and utilities. Centerline profiles were run on structures which appeared to be the most promising. Valley cross-sections were run to determine storm effects and channel capacities at critical areas and below dam sites. Stage-storage surveys were made on various sites to determine the accuracy of the U. S. Geological Survey topographic maps for developing stage-storage information. These surveys proved the need for correcting some of the storage and surface area values derived from 1:62,500 scale topographic maps. All designs were based on Soil Conservation Service criteria. All structures were classified according to the hazard regarding existing and future developments downstream from the proposed site.


LAKE ONTARIO
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ORLEANS
WAYNE
MONROE
GENESEE
LIVINGSTON
ONTARIO
WYOMING
ROCHESTER
BATAVIA
NEW YORK STATE
BARGE CANAL
BLACK CREEK
RED CREEK
HONEOYE CREEK
SPRING CREEK
BIGELOW CREEK
OATKA CREEK
MUD CREEK
SPRING BROOK
BEBEE CR.
HEMLOCK OUTLET
CONESUS CREEK
CONESUS LAKE
HEMLOCK LAKE
HONEOYE LAKE
CANADICE LAKE
RIVER
GENESEE
LITTLE BEARDS CR.
BEARDS CR.
SILVER LAKE
SILVER LAKE OUTLET
WOLF CREEK
EAST KOY CREEK
WISCOY CREEK
COLD CREEK
KESHEQUA CREEK
CANASERAGA CREEK
BRADNER CR.
SUGAR CREEK
SPRINGWATER CREEK
MILL CREEK
STONY BROOK
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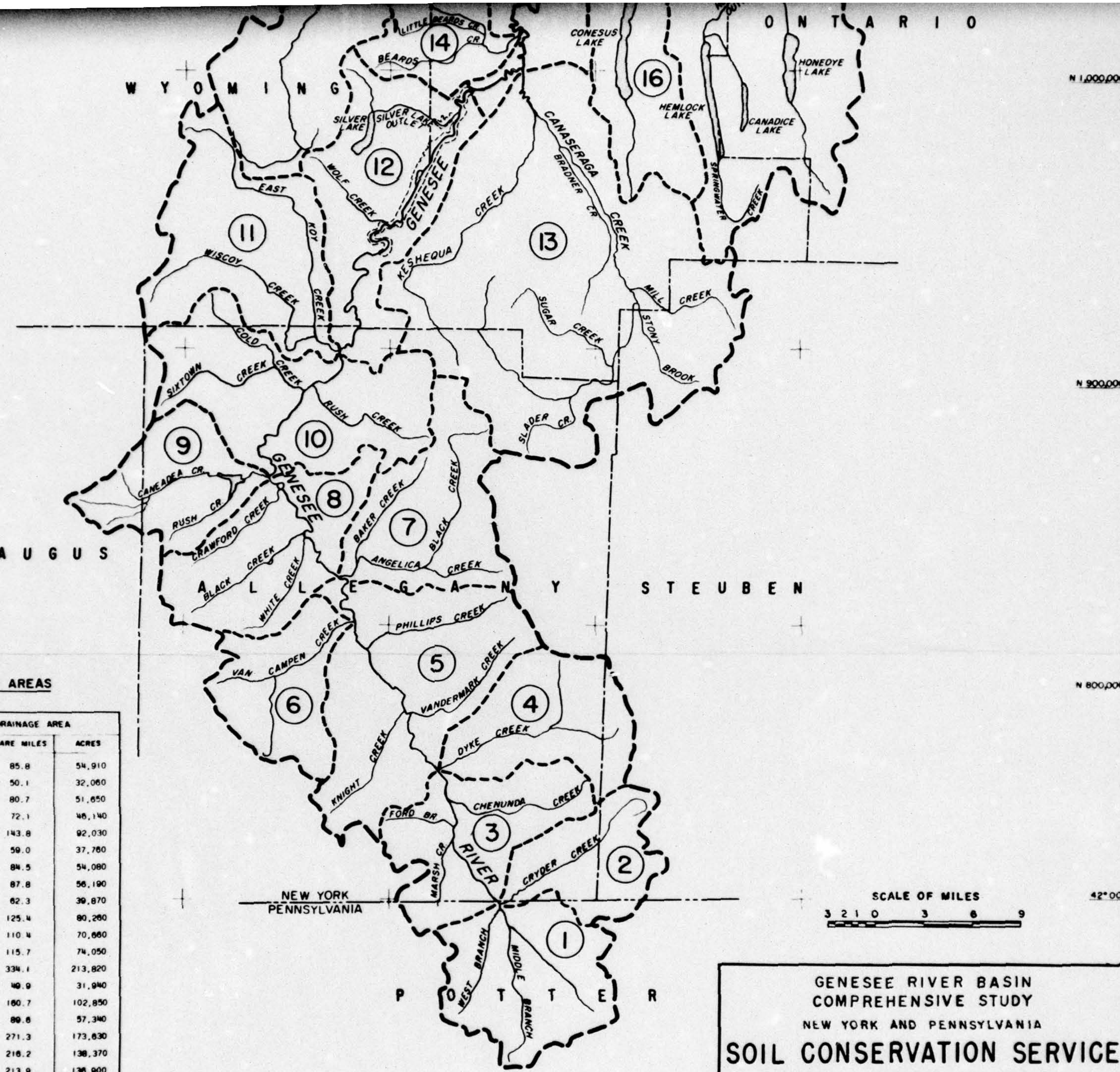


SUBWATERSHED AREAS

SUBWATERSHED		DRAINAGE AREA	
NUMBER	NAME	SQUARE MILES	ACRES
1	GENESEE SOUTH	85.8	54,910
2	CRYDER CREEK	50.1	32,060
3	GENESEE CHENUNDA	80.7	51,650
4	DYKE CREEK	72.1	46,140
5	GENESEE VANDERMARK	143.8	92,030
6	VAN CAMPEN CREEK	59.0	37,760
7	ANGELICA CREEK	84.5	54,080
8	GENESEE SOUTH BLACK	87.8	56,190
9	CANEADEA CREEK	62.3	39,870
10	GENESEE COLD CREEK	125.4	80,260
11	WISCOY CREEK	110.4	70,660
12	SILVER LAKE OUTLET	115.7	74,050
13	CANASERAGA CREEK	334.1	213,820
14	BEARDS CREEK	49.9	31,940
15	GENESEE GENESEO	160.7	102,850
16	CONESUS LAKE	89.6	57,340
17	HONEOYE CREEK	271.3	173,630
18	OATKA CREEK	216.2	138,370
19	BLACK CREEK	213.9	136,900
20	GENESEE ROCHESTER	66.1	42,300
TOTAL		2,479.4	1 586,810

DATA COMPILED BY U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

SOIL CONSERVATION SERVICE SUBWATERSHED AREAS

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE B4

FIGURE B4

TABLE B-25. Preliminary data summary - upland reservoirs

Watershed area No.	Total[(1)] No. of sites	Breakdown of feasible sites by purpose: Flood[(2)] prevention	Irrigation	Fish & wildlife	Recreation	Recreation plus: Fish & wildlife	Supply[(3)]	Regulation[(4)]	Low Flow Augmentation
1	5	4			1				
2	4	3						1	
3	4	2						2	
4	6	3					1	2	
5	5	3		1	1				
6	5	3					1	1	
7	6	2		1		1		2	
8	5	2				1		2	
9									
10	11	4		1	2			4	
11	7	3	2	1				1	
12	1	1							
13	11	2		3	1	1	3		1
14	3			2		1			
15	4					1	3		
16	2					1			1
17	8		2	3		1	1		1
18	5			1			2		2
19	2				1				1
20	1			1					
TOTAL	95	32	4	14	6	7	11	15	6

(1) Sites for which design and cost data was developed.
(2) Not feasible by year 1980.
(3) Municipal and Industrial.
(4) Downstream sites.

8. The designed height of the dams, and the size of the pools were affected by one or many of the following factors: (1) The storage volume needed to retard a 100-year frequency storm without discharge occurring in the emergency spillway, (2) The volume required to contain the emergency spillway and freeboard hydrographs, (3) The selected beneficial storage volume, (4) The additional storage needed for 100-year sediment accumulation, (5) Limiting topographic or geologic features, (6) Allowable downstream release rates, and (7) Critical elevations of existing facilities in the pool area. Embankment volumes were computed using surveyed centerlines or using centerlines plotted from U. S. Geological Survey topographic maps.

9. The intensity of geologic investigation depended upon the physical characteristics of the site area, the potential use of the site, and the significance of geology upon the probable feasibility. Field work when considered necessary, followed map reviews of topographic and soils maps. Surface observation, shallow test holes, hand auger holes, local well records or information, and electric resistivity measurements were conducted.

10. Erosion and sediment studies were carried out to determine the amount of sediment accumulation expected over a 100-year period. Factors taken into account were: expected land use, sheet and gully erosion, and streambank erosion.

11. Construction cost estimates were developed for all reservoirs on the basis of compacted fill using a unit price per cubic yard. This unit price represents all normal construction items except clearing and seeding. The unit price is based on a comparative study of actual contract cost of structures which were installed in the northeast United States under the Public Law 566, Watershed Protection Program.

12. Clearing and seeding costs were based on dam and permanent pool size and the respective wooded area involved. Where unfavorable geologic conditions exist, a cost of treating the condition was estimated. All total installation costs include construction cost plus 20 percent contingencies, 34 percent installation services, easements, acquisitions, relocations and 1 percent for administration of contracts. Costs of easements, acquisitions, and relocations were estimated by Soil Conservation Service technicians and were based on values obtained from several sources, including local representatives of utilities and highways.

13. DISCUSSION

The preliminary structural plan presented cost and design data for those structures selected as having potential to meet expected needs by the year 2020. Structures which may have future potential and which could be considered as alternates in plan formulation were listed separately. The structural plan was developed and presented as separate units according to purpose in the manner indicated below:

a. Flood Prevention - Various structural measures were investigated to alleviate flooding conditions at noted damage areas. These structural measures included both flood retarding reservoirs and channel improvement where appropriate. Flood prevention reservoirs which were selected to reduce flood damages are too costly to be justified for flood prevention alone. Some sites, may, however, be constructed feasibly for multiple-purpose use where flood prevention is not the primary purpose. A total of 35 sites in the Genesee River Basin were selected which would provide some degree of flood prevention benefits.

b. Irrigation - A total of five sites appeared feasible to provide water for irrigation in the Genesee Basin. The beneficial storage provided by each site is proportional to the number of acres available to irrigate from that particular structure. Multiple-purpose use of an irrigation reservoir is limited due to the wide fluctuation of the water level. This fluctuation is not conducive to such uses as recreation or fish and wildlife habitat. However, such sites could be constructed to provide additional storage for other water supply needs. Only three watersheds (11, 17 and 19) were involved in the final determination of feasible irrigation structures in the Basin. In all of them, one site was sufficient to supply irrigation water to the majority of the irrigable acreage although alternative sites were available in each.

c. Fish and Wildlife - Coordinating agencies of Task Group No. 9, Fish and Wildlife studies, determined that twenty-one inpoundment sites would be feasible for fish and wildlife habitat. These sites were recommended based upon preliminary needs and benefits. In addition, preliminary designs and cost estimates were made for twenty-six sites which were previously shown as having potential fish and wildlife benefits in prior screenings. Twelve other sites were recommended as potential sites to meet increased needs by the year 2020.

d. Recreation - The twenty-eight sites selected for recreational use were those recommended by Task Group 8, Recreation Studies, and other sites which appear suitable for smaller type recreational development. Factors affecting the structural selection included the availability of access, fluctuation and size of water surface, characteristics of surrounding terrain and vegetation, dependability water yield, and geology conditions affecting leakage.

e. Low flow augmentation and municipal and industrial water supply - These sites were selected based on project needs furnished by Task Group No. 4. Six sites were selected for low flow augmentation and eleven for municipal and industrial water supply. All structures selected were located near problem areas and have good permanent storage potential. Multiple-purpose use of these sites is probably limited to flood prevention, irrigation, and regulation of a downstream site.

f. Regulation of a downstream site - The purpose of sites selected for regulation is to provide a dependable and regulated water supply for a larger structure located downstream. The large downstream site under present concern is located near Portage, New York on the Genesee River. It is a Corps of Engineers, multiple-purpose site, involving recreation, power and water quality. Fifteen sites were selected as potential regulation sites for use in conjunction with the Portage site. The feasibility and final selection of any of these sites would depend upon the final supply requirements of the Portage site, if any.

14. CONCLUSIONS

The tentative structural plan formulated on a single purpose basis provided an inventory of potential structure site locations and second, selected those structures which appeared feasible to meet preliminary needs. Much of this program had to be considered preliminary since only preliminary needs and benefits had been determined by Task Groups No. 4, 8 and 9. In final plan formulation, coordination between the various agencies and task groups determined the best use or combination of uses for each structure to meet the finalized needs.

GENESEE RIVER BASIN COMPREHENSIVE STUDY

APPENDIX B

SECTION IV - ESTABLISHMENT OF THE PLAN OF DEVELOPMENT

CRITERIA FOR PROJECT FORMULATION

1. In accordance with principles established by the Coordinating Committee at the outset of the basin study, the primary considerations were that future water resource development needs be identified in general nature and scope, that detailed investigations sufficient for authorization be made only for Federal or Federally-assisted projects requiring initiation of construction within 10 to 15 years after study completion, that any investigation be terminated upon establishment that a justifiable improvement would not be produced, and that other non-Federal or Federal programs to supplement or utilize projects for which authorization is sought be identified as to general nature and scope. As the study developed, it was further concluded that project analysis would be oriented to the primary criterion of economic efficiency as reflected in the comparison of tangible benefits and project costs. Portions of the Genesee River basin and service area fall within the region covered by the Appalachian Water Resources Study and Genesee River basin projects within that region will be reanalyzed using evaluation techniques and criteria developed for the regional study. To maintain uniformity of analysis in the basin study, neither redevelopment benefits nor regional expansion-type benefits were included in evaluating projects for the Genesee River basin.

2. ESTIMATES OF COST

First costs for considered projects included expenditures for construction, lands, relocations, clearing, engineering and design, and supervision and administration. Project costs used herein are taken from appendix C, estimates for power facilities are taken from appendix L, and costs for recreation facilities, including discounted costs for future additions, are derived from appendix M. Waste treatment facility costs are found in appendix H. Annual charges for projects analyzed include interest and amortization of total investments with an interest rate of 3-1/8 percent for a 100-year period, operation and maintenance cost, and annual equivalent costs of major replacements for facilities for power, waste treatment and future recreation developments.

3. BASIS FOR ESTIMATES OF BENEFITS

Average annual benefits for the various purposes were estimated by the task groups concerned as documented in relevant appendices and were derived either for individual projects, or where a given purpose could be served by two or more projects, were derived for particular reaches or localities. Purposes providing benefits at projects investigated are further discussed in following subparagraphs.

a. Flood control - Benefits were based on reductions of flood damages as determined from discharge - damage - frequency relationships for selected reaches as described in appendix F. In general, beneficial effects attributable to reservoir sites were confined to single reaches and were not accumulative downstream. Potential benefits for major sites were small and not significant in project justification studies.

b. Water supply - Domestic, industrial and rural present and expected future demands for water were found to be capable of being adequately served by means other than reservoir storage as reported in appendix H. Water supply for supplemental irrigation was evaluated in appendix J and potential benefits were based on increases in annual yield, net of on-farm costs, from lands expected to be irrigated. Sites capable of irrigating Ontario Lake Plain lands, and headwaters lands are analyzed in appendix J. Lands irrigable from major reservoir sites were capable of providing, net benefits, estimated by the Department of Agriculture, of about $16.00 per acre on about 3,780 acres located below Stannard site. Major sites could also deliver water to the Genesee River-Barge Canal crossing for lands in the Ontario Lake Plain which would be irrigable from the canal. Benefits on these lands would be about $21.00 per acre less the cost of delivery to the land from the canal. However, because of deterrent factors discussed above in Section II, paragraph 16, irrigation represents potential for future development rather than an immediate need. Development of Department of Agriculture proposals for irrigation on the Lake Plain should precede further consideration of major reservoir sites for this purpose. Consequently, irrigation benefits were not evaluated in final formulation studies for these sites, although water could be made available from any of the sites for an irrigation district or other organization capable of executing repayment agreements.

c. Water quality - Benefits from improvement of water quality by low flow augmentation were computed on the basis of the least costly means of obtaining the same quality from an

alternative source, from advanced waste treatment, or from diversion of waste loads. For the Genesee River below Court Street Dam in Rochester, secondary treatment plus waste diversion was most economical with an annual cost of $500,000 as determined in appendix H. Genesee River reaches at Avon,* New York, and below the Gates - Chili - Ogden treatment plant would require treatment facilities with annual costs of $55,000 and $101,000, respectively. Reservoir storage would provide the needed flow augmentation at less cost as described in the Portage site analysis below.

d. Hydroelectric power - Power benefits were computed by using costs of the most likely alternative source, in the Rochester vicinity. On this basis, a capacity value of $19.00 per kilowatt, and an energy value of 2.3 mills per kilowatt hour were used. For comparability purposes, power values with a Federally-financed steam plant were $10.00 per kilowatt of capacity and 2.3 mills per kilowatt hour of energy.

e. Recreation, fish and wildlife enhancement - Recreation benefits for general outdoor activities, and for fishing and hunting, were computed from estimated visitation and recreation value. General recreation benefits are taken from appendix M and hunting and fishing benefits from appendix N. For projects expected to be developed in stages, future increments of benefits were reduced to average annual equivalent values by appropriate discounting procedures described in specific site evaluations below. There will be direct wildlife losses due to all large reservoirs which will not be replaced by any wildlife values created by the project.

EVALUATION OF MAJOR RESERVOIR SITES

4. The five major reservoir sites selected in the preliminary analysis were given more detailed study including cost estimates for additional scales of development and including estimates of benefits obtainable from multiple-purpose operations. Economic studies were initially limited to the detail needed to establish best usage and potential feasibility. Angelica and Belfast sites were found economically unjustified based on tangible benefit evaluations for either single-purpose or multiple-purpose operation. Stannard and Tuscarora sites were found to be marginal as single-purpose recreation sites only. Portage site was shown to be economically justified as a multiple-purpose reservoir providing benefits primarily from recreation and pumped storage power.

* Secondary treatment will be adequate based on more recent studies by the USGS indicating a higher minimum average 7 day 1-in-10-year flow.

Locations of sites are shown on figure B-2, and project descriptions, relevant data and estimates of cost may be found in appendix C. Dam and reservoir cost curves for the five sites are shown on figure B-5. Summaries of project data for the five sites are shown in tables B-26 through B-30. Results of feasibility studies are summarized in paragraphs following.

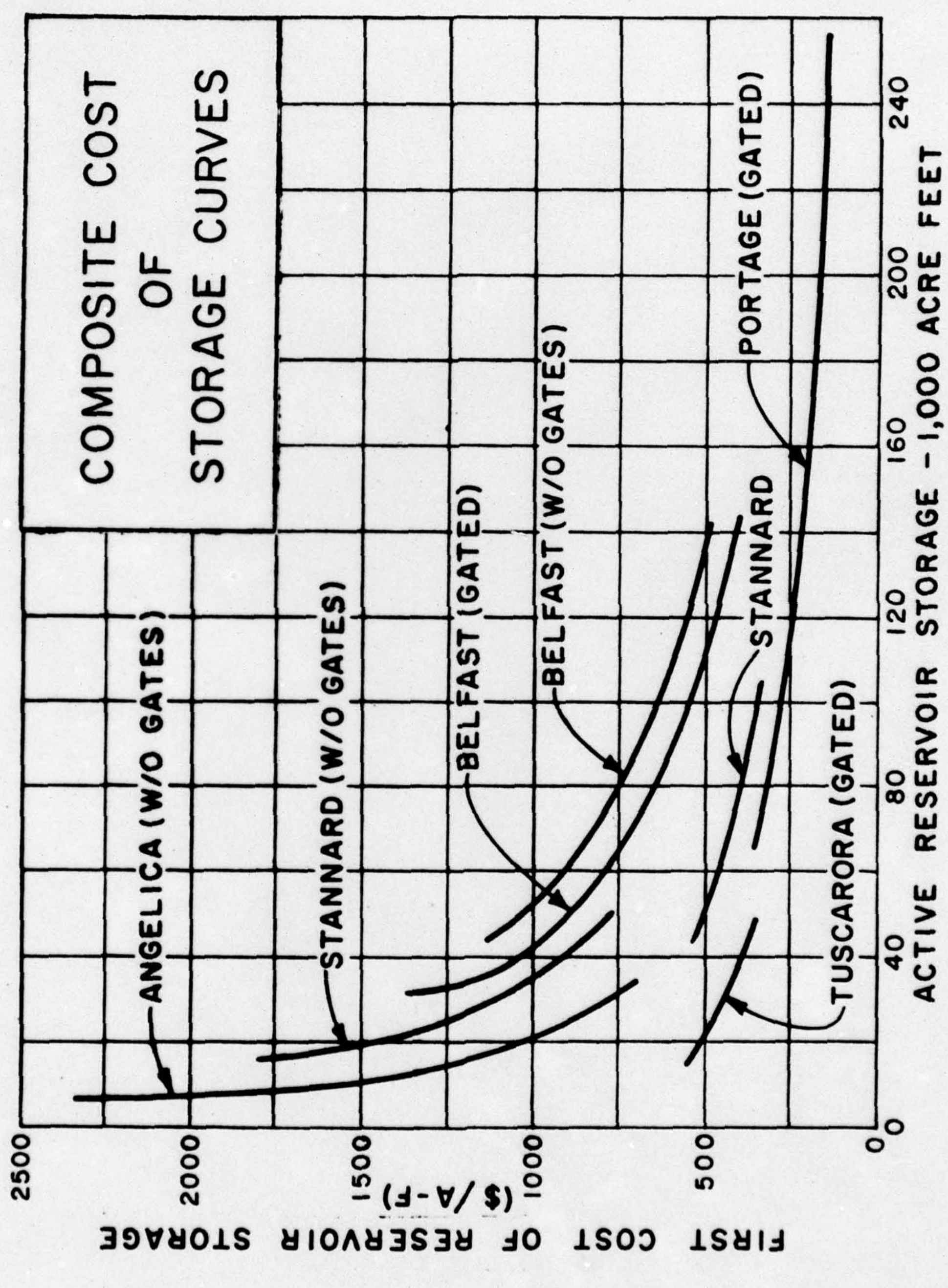

COMPOSITE COST OF STORAGE CURVES
ANGELICA (W/O GATES)
STANNARD (W/O GATES)
BELFAST (GATED)
BELFAST (W/O GATES)
STANNARD
PORTAGE (GATED)
TUSCARORA (GATED)
FIRST COST OF RESERVOIR STORAGE ($/A-F)
0
500
1000
1500
2000
2500
ACTIVE RESERVOIR STORAGE - 1,000 ACRE FEET
0
40
80
120
160
200
240

FIGURE B5

TABLE B-26. Project data, Stannard site

	2" Storage (1)	3½" Storage (1)	5½" Storage (1)	9" Storage (2)	10½" Storage (2)
	Uncontrolled Spillway			Gated Spillway	
Type of structure	Earth dam, concrete overflow spillway				
Spillway crest elevation	1,576 ft	1,587 ft	1,598 ft	1,587 ft	1,593 ft
Effective spillway length	275 ft	275 ft	275 ft	275 ft	190 ft
Top of gates, elevation				1,614 ft	1,620 ft
Top of embankment elevation	1,609 ft	1,619 ft	1,630 ft	1,621 ft	1,630 ft
Spillway design discharge	135,000 cfs	127,000 cfs	125,200 cfs	143,000 cfs	116,000 cfs
Spillway design flood elevation	1,604 ft	1,614 ft	1,625 ft	1,616 ft	1,625 ft
Head on crest	28 ft	27 ft	27 ft	29 ft	32 ft
Channel elevation at toe of dam	1,533 ft	1,533 ft	1,533 ft	1,533 ft	1,533 ft
Max probable tailwater elevation	1,558 ft	1,558 ft	1,558 ft	1,559 ft	1,554 ft
Area of outlet works	240 sq ft	240 sq ft	240 sq ft	240 sq ft	240 sq ft
Top of Marsh Creek dike elevation	1,609 ft	1,619 ft	1,630 ft	1,621 ft	1,630 ft
	Reservoir area and capacity				
Capacity, top of gates				81,000 A-ft	93,000 A-ft
Capacity, spillway crest	18,500 A-ft	31,000 A-ft	49,000 A-ft	31,000 A-ft	39,000 A-ft
Pool area, spillway crest	1,000 acres	1,400 acres	1,700 acres	1,400 acres	1,500 acres
Sediment pool elevation	1,550 ft	1,550 ft	1,551 ft	1,551 ft	1,551 ft
Capacity, sediment pool	1,800 A-ft	1,800 A-ft	1,900 A-ft	1,900 A-ft	2,000 A-ft
	Project Costs				
First cost: Dam and reservoir	$ 27,800,000	$ 30,900,000	$ 37,310,000	$ 30,060,000	$ 31,750,000
Real estate (3)	950,000	1,100,000	1,290,000	1,540,000	1,600,000
Total first cost	$ 28,750,000	$ 32,000,000	$ 38,600,000	$ 31,600,000	$ 33,350,000
Annual charges (4)	$ 1,070,000	$ 1,180,000	$ 1,410,000	$ 1,130,000	$ 1,190,000

(1) Storage capacity below spillway crest.
(2) Storage capacity below top of gates.
(3) Including estimated minimum lands required for recreational development.
(4) Interest and amortization on investment at 3 1/8 percent for 100-year life, plus operation and maintenance of dam and reservoir.

TABLE B-27. Project data, Belfast site

	1-1/2" Storage (1)	3" Storage (1)	4-3/4" Storage (1)	2-1/2" Storage (2)
	Gated spillway			Uncontrolled spillway
Type of structure	Earth dam, concrete overflow spillway			
Spillway crest elevation	1310 ft	1326 ft	1340 ft	1351 ft
Effective length of spillway	375 ft	375 ft	375 ft	700 ft
Inches of storage at spillway crest	1/4 in	3/4 in	1-1/2 in	2-1/2 in
Top of embankment elevation	1351 ft	1366 ft	1380 ft	1380 ft
Top of gates elevation	1340 ft	1356 ft	1370 ft	
Spillway design discharge	271,000 cfs	260,000 cfs	262,000 cfs	262,000 cfs
Spillway design flood elevation	1346 ft	1361 ft	1375 ft	1375 ft
Head on crest	36 ft	35 ft	35 ft	24 ft
Channel elevation at toe of dam	1270 ft	1270 ft	1270 ft	1270 ft
Max. probable tailwater elevation	1322 ft	1321 ft	1321 ft	1321 ft
Area of outlet works	400 sq ft	400 sq ft	400 sq ft	400 sq ft
	Reservoir area and capacity			
Capacity, top of gates	48,000 A-ft	92,000 A-ft	144,000 A-ft	
Capacity, spillway crest	4,500 A-ft	21,000 A-ft	48,000 A-ft	77,000 A-ft
Pool area, spillway crest	600 acres	1,500 acres	2,300 acres	3,000 acres
Sediment pool elevation	1,322 ft	1,323 ft	1,324 ft	1,323 ft
Capacity, sediment pool	15,400 A-ft	17,000 A-ft	17,600 A-ft	16,600 A-ft
	Project costs			
First cost: Dam and reservoir	$ 43,400,000	$48,200,000	$54,000,000	$52,800,000
Real estate (3)	1,600,000	2,150,000	2,500,000	2,000,000
Total first cost	45,000,000	50,350,000	56,500,000	54,800,000
Annual charges (4)	$ 1,650,000	$ 1,850,000	$ 2,050,000	$ 2,000,000

(1) Storage capacity below top of gates.
(2) Storage capacity below spillway crest.
(3) Including estimated minimum lands required for recreational development.
(4) Interest and amortization on investment at 3-1/8 percent for 100-year life, plus operation and maintenance of dam and reservoir.

TABLE B-28. Project data, Angelica site

	3" Storage (1)	6" Storage (1)	10" Storage (1)
Type of structure	Earth dam, concrete overflow spillway(uncontrolled)		
Spillway crest elevation	1,540 ft.	1,558 ft.	1,574 ft.
Effective spillway length	225 ft.	225 ft.	225 ft.
Top of embankment elevation	1,570 ft.	1,585 ft.	1,600 ft.
Spillway design discharge	84,500 cfs.	75,000 cfs.	69,000 cfs.
Spillway design flood elev.	1,564 ft.	1,580 ft.	1,595 ft.
Head on Crest	24 ft.	22 ft.	21 ft.
Channel Elevation, toe of dam	1,464 ft.	1,464 ft.	1,464 ft.
Area of outlet works	60 sq. ft.	60 sq. ft.	60 sq. ft.
	Reservoir area and capacity		
Capacity, spillway crest	8,800 A-ft.	17,200 A-ft.	28,800 A-ft.
Pool area, spillway crest	320 acres	600 acres	870 acres
Sediment pool elevation	1,506 ft.	1,507 ft.	1,507 ft.
Capacity, sediment pool	1,600 A-ft.	1,700 A-ft.	1,700 A-ft.
	Project costs		
First cost: Dam and reservoir	$15,300,000	$18,300,000	$22,000,000
Real estate (2)	600,000	760,000	800,000
Total first cost	$15,900,000	$19,060,000	$22,800,000
Annual charges (3)	$ 600,000	$ 710,000	$ 850,000

(1) Storage capacity below spillway crest.
(2) Including estimated minimum lands required for recreational development.
(3) Interest and amortization on investment at 3-1/8 percent for 100-year life, plus operation and maintenance of dam and reservoir.

TABLE B -29 . Project data, Tuscarora site

	13" Storage (1)	7-1/2" Storage (1)
Type of structure	Earth dam, concrete overflow spillway, (gated)	
Spillway crest elevation	784 ft	754 ft
Effective spillway length	130 ft	130 ft
Top of gates elevation	810 ft	784 ft
Top of embankment elevation	820 ft	794 ft
Spillway design discharge	72,000 cfs	75,000 cfs
Spillway design flood elevation	815 ft	789 ft
Head on crest	31 ft	35 ft
Channel elevation, toe of dam	670 ft	670 ft
Max. probable tailwater elevation	694 ft	694 ft
Area of outlet works	60 sq ft	60 sq ft
	Reservoir area and capacity	
Capacity, top of gates	46,000 A-ft	24,000 A-ft
Capacity, spillway crest	27,000 A-ft	11,000 A-ft
Pool area, spillway crest	660 acres	290 acres
Sediment pool elevation	720 ft	720 ft
Capacity, sediment pool	2,500 A-ft	2,500 A-ft
	Project costs	
First cost: Dam and reservoir	$ 15,900,000	$ 12,150,000
Real estate (2)	590,000	560,000
Total first cost	$ 16,490,000	$ 12,710,000
Annual charges (3)	$ 590,000	$ 455,000

(1) Storage capacity below top of gates.
(2) Including estimated minimum lands required for recreational. development.
(3) Interest and amortization on investment at 3-1/8 percent for 100-year life, plus operation and maintenance of dam and reservoir.

TABLE B-30. Project data, Portage site

	5½" Storage (1)	3½" Storage (1)	2" Storage (1)
Type of structure	Concrete gravity dam with overflow spillway (gated)		
Spillway crest elevation	1,160 ft	1,143 ft	1,125 ft
Effective spillway length	430 ft	430 ft	430 ft
Storage at spillway crest	2 1/4 in	1 1/4 in	1/2 in
Top of embankment elevation	1,200 ft	1,184 ft	1,167 ft
Top of gates elevation	1,190 ft	1,173 ft	1,155 ft
Height of gates	30 ft	30 ft	30 ft
Spillway design discharge	310,000 cfs	324,000 cfs	335,000 cfs
Spillway design flood elevation	1,195 ft	1,179 ft	1,162 ft
Head on crest	35 ft	36 ft	37 ft
Channel elevation, toe of dam	1,085 ft	1,085 ft	1,085 ft
Stilling basin width	430 ft	430 ft	430 ft
Stilling basin length	247 ft	236 ft	218 ft
Elevation of floor slab	1,065 ft	1,065 ft	1,065 ft
Height of end sill	16 ft	16 ft	16 ft
Max probable tailwater elevation	1,131 ft	1,132 ft	1,132 ft
Area of outlet works	400 sq ft	400 sq ft	400 sq ft
Max area of each conduit	45 sq ft	45 sq ft	45 sq ft
Training wall elevation	1,140 ft	1,142 ft	1,142 ft
	Reservoir area and capacity		
Capacity, top of gates	283,000 A-ft	182,000 A-ft	103,000 A-ft
Capacity, spillway crest	124,000 A-ft	62,000 A-ft	22,000 A-ft
Pool area, spillway crest	4,100 acres	2,900 acres	1,500 acres
Sediment pool elevation	1,131 ft	1,130 ft	1,120 ft
Capacity, sediment pool	31,000 A-ft	27,500 A-ft	15,700 A-ft
	Project costs		
First cost: Dam and reservoir	$32,000,000	30,400,000	28,300,000
Real estate (2)	3,330,000	2,820,000	2,350,000
Total first cost	36,130,000	33,220,000	30,650,000
Annual charges (3)	$ 1,300,000	1,190,000	1,100,000

(1) Storage capacity below top of gates.
(2) Including estimated minimum lands required for recreational development.
(3) Interest and amortization on investment at 3 1/8 percent for 100-year life, plus operation and maintenance of dam and reservoir.

STANNARD PROJECT

5. GENERAL

The Stannard project, farthest upstream of major sites on the river, would be located about 4 miles south of Wellsville, New York, controlling 168 square miles of drainage area. The structure would be an earth dam with concrete overflow spillway section creating a reservoir 4 to 8 miles long with surface area at full pool of 1,000 acres to 3,000 acres, respectively, depending upon the scale of development. Capacities considered ranged from 18,500 acre-feet to 49,000 acre-feet with an uncontrolled spillway and from 49,000 acre-feet to 93,000 acre-feet with a gated structure. Project data are summarized in table B-26.

6. POTENTIAL BENEFITS

Flood control benefits, while largest for any major sites considered, could provide an average annual total of only $31,000 in damage reduction downstream from the site. Storage for this purpose could not be justified. Benefits from meeting a portion of the water quality requirement in the Genesee River below Court Street Dam in Rochester could total $315,000 annually, based on costs of the advanced treatment alternative, if 50,000 acre-feet of reservoir storage could be drawn upon without consideration of recreation requirements and provided that additional and approximately equal storage were available to meet the total water quality requirement. No feasible site to provide the additional storage was found except for the Portage Project determined to be best operated without the required storage being allocated to quality improvement. Fish and wildlife benefits were estimated by the U. S. Fish and Wildlife Service at $790,000 from an annual use by 150,000 visitors on a pool area of 1,500 acres and contingent upon control of reservoir drawdown during the recreation season. The general outdoor recreation task group was opposed to development of the site primarily because of adverse effects upon white-water canoeing on upper reaches of the river during the spring runoff period. For plans of development involving relatively severe drawdown during the recreation season, outdoor recreation benefits were estimated by the Bureau of Outdoor Recreation at about $77,500 from 155,000 visitor-days annually. Maximum potential by the Corps of Engineers at $225,000 from annual visitation by 340,000 recreationists. Operated primarily for water quality and fish and wildlife purposes, Stannard site could provide minor power benefits of about $7,000 annually through reduced requirements for pumping energy at the Portage project. The project was assumed to be

operated to increase dependable low flow from a 30-day average discharge of about 7 cfs under existing conditions to about 20 cfs with the project. No estimates were made for tangible benefits which might accrue through this increase.

7. FUTURE INDUSTRIAL WATER SUPPLY

The New York State Conservation Department representative on the plan formulation task group requested consideration of the Stannard site as a source of water for a possible wood pulp or paper processing plant on the Genesee River below Wellsville. There is no firm commitment that such a plant would be built and industrial water demand would, therefore, not constitute a basis for recommendations at this time. However, an approximate evaluation was made of a site capable of supplying an estimated average requirement of about 90 million gallons per day. Benefits, based on cost of a single-purpose project at Stannard site would be $1,205,000 annually for the 66,000 acre-feet of capacity required for yield, sediment storage and losses.

8. RECREATION PLANS

Although the recreation task group did not favor development of Stannard site, the three dams designed with uncontrolled spillways were evaluated assuming single-purpose operation for recreation including fish and wildlife enhancement and using benefits as estimated by the Corps of Engineers. In addition a structure with crest gate control and providing storage equivalent to that in the ungated structure with highest benefit-cost ratio, was also evaluated. Results of the analysis are summarized in table B-31.

TABLE B-31. Stannard site, recreation only

	Storage-inches on drainage area			
	2"	3½"	5½"	5½"
	- - - uncontrolled		- -	Gated
Top of gates el.-ft.	-	-	-	1,598
Capacity-acre-ft.	-	-	-	49,000
Spillway crest el.-ft.	1,576	1,587	1,598	1,571
Capacity-acre-ft.	18,500	31,000	49,000	14,000
Min.recreation pool el.-ft.(1)	1,570	1,582	1,595	1,595
Max.recreation pool el.-ft.	1,576	1,587	1,598	1,598
Pool area-acres	1,000	1,400	1,700	1,700
Recreation-1,000 visitor-days	200	280	340	340
Annual benefits-$1,000	150	182	255	255
Fishing-1,000 fisherman-days(2)	100	140	170	170
Annual benefits-$1,000	493	694	852	852
Total benefits-$1,000	643	876	1,107	1,107
Annual charges, dam & reservoir-$1,000	1,070	1,180	1,410	880
Annual charges, recr.facilities-$1,000	94	132	161	161
Total annual charges-$1,000	1,164	1,312	1,571	1,041
Benefit-cost ratio	0.6	0.7	0.7	1.06

(1) Based on 6,000 acre-ft. for minimum dependable release of 20 cfs.
(2) Values are projected from estimates of potential benefits given in paragraph 6, which were based on surface area. It is recognized, that at any given level of pool, use will depend upon the permanency of the pool, the configuration of the littoral zone at various pool levels, the general productivity characteristics of the reservoir at various levels, and other factors which have not been analyzed in detail for these several storage capacity plans.

Although further study of Stannard site for recreation is not within the scope of this report, future consideration of a gated, single-purpose structure for recreation would be warranted by an appropriate agency.

9. MULTIPLE-PURPOSE PLANS

The gated structure providing 9 inches of storage was evaluated as a project for recreation and low flow augmentation for water quality. Dependable flow would be increased to 20 cfs as in recreation plans. The structure with 10-1/2 inches of storage was evaluated for recreation and industrial water supply. Each project would provide minor benefits if pumped storage power were developed at the Portage site. Results of the analysis are summarized in table B-32.

TABLE B-32. Stannard site, multiple-purpose plans

	Storage-inches on damage area	
	9"	10½"
Top of gates el.-ft.	1,614	1,620
Capacity-acre-ft.	81,000	93,000
Spillway crest el.-ft.	1,587	1,593
Capacity-acre-ft.	31,000	39,000
Water quality storage-acre-ft.(1)	56,000	-
Water supply storage-acre-ft.(1)	-	66,000
Joint use pool el.-ft.	1,614	1,620
Min. recreation pool el.-ft.	1,582	1,584
Pool area - acres	1,200	1,280
Recreation-1,000 visitor-days	155	155
Annual benefits-$1,000	78	78
Fishing-1,000 fisherman-days	120	128
Annual benefits-$1,000	588	630
Water quality benefits-$1,000	315	-
Water supply benefits-$1,000	-	1,040
Power benefits-$1,000	7	7
Total annual benefits-$1,000	988	1,755
Annual charges, dam & reser. - $1,000	1,145	1,190
Annual charges, recr.facilities- $1,000	86	86
Total annual charges-$1,000	1,231	1,276
Benefit-cost ratio	0.8	1.3

(1) Includes losses.

BELFAST PROJECT

10. GENERAL

The project would consist of an earth dam on the Genesee River about 2-1/2 miles upstream from Belfast, New York, and would control a drainage area of 578 square miles. The spillway would be a gated concrete gravity overflow section and, because of the great depth of overburden in the wide river valley at the site, would be located in an area excavated from the left valley wall to provide a rock foundation. The Southern Tier Expressway, a limited access highway under design in 1967, is planned to cross the river near the mid-point of the considered reservoir and development of the site would require relocation of the planned route to a less favorable alignment further to the south. Belfast project cost estimates were derived for scales of development providing 1-1/2 inches, 3 inches, and 4-3/4 inches of storage. An additional estimate was made for a dam with uncontrolled spillway and with 2-1/2 inches of storage. The reservoir at full pool would be about six miles long and have a maximum width of 3/4 of a mile for the largest scale of development considered. Pool area would be 4,000 acres. Project data are summarized in table B-27.

11. CONSIDERED DEVELOPMENT

Maximum potential flood control benefits of about $4,500 annually would not make provision of the necessary storage incrementally justified and no further consideration was given to this purpose. Preliminary evaluation of general recreation and fish and wildlife benefits showed that a project operated primarily for these purposes would not be economically feasible for any scale of development reasonable for the site. Final evaluation of the project was made considering the primary function to be meeting the major demonstrated need for water quality improvement. This would require development to maximum scale as limited by topography. Recreation, fish and wildlife benefits were estimated by the Corps of Engineers since the recreation task group did not recommend site development and the fish and wildlife task group estimated benefits only for a reservoir operated with minimum drawdown until October of each year. Corps estimates were developed with recognition that the required drawdown would limit attendance and unit values. As set forth elsewhere in this appendix, water quality control benefits for the Rochester reach would be $500,000 annually based on the alternative cost of advanced treatment or waste diversion. For the Avon and

Gates-Chili-Ogden reaches, benefits would be $138,000 annually based on costs for the alternative storage projects. Assuming that Portage project were developed for hydroelectric power, about $14,000 annually would be credited to Belfast project for reduced pumping energy requirements at the downstream site. Results of analysis of Belfast project, operated primarily for water quality control and with incidental benefits from recreation and power, are shown in table B-33.

Table B-33. Belfast site multiple-purpose plan

Item	4-3/4" storage
Top of gates elevation - ft	1,370
Capacity - acre - ft	144,000
Spillway crest elevation - ft	1,340
Capacity - acre - ft	48,000
Water quality storage - acre - ft (1)	113,000
Min. recreation pool elevation - ft	1,332
Min. recreation pool area - acres	1,800
Recreation - visitor days	230,000
Annual benefits	$160,000
Fishing - fisherman - days	144,000
Annual benefits	$216,000
Water quality control benefits	$638,000
Power benefits	$ 14,000
Total annual benefits	$1,028,000
Annual charges, dam and reservoir	$2,050,000
Annual charges, recreation facilities	$ 112,000
Total annual charges	$2,162,000
Benefit-cost ratio	0.5

(1) Includes losses

Since consideration of immediate basin needs capable of being met by Belfast project indicated that economic feasibility would not result, further evaluation of the site was not made.

ANGELICA PROJECT

12. GENERAL

Angelica Creek, a tributary of the Genesee River, enters the river from the east at a point about 5 miles upstream from Belfast, New York. The project site is on the creek about four miles above the confluence and one mile upstream from Angelica, New York. Drainage area at the site is 54 square miles. The structure would be an earth embankment with a maximum height of 130 feet and the concrete overflow spillway would be uncontrolled and located adjacent to the right bank to avoid the area of deep overburden in the stream valley. The reservoir at full pool would be approximately 3-1/2 miles long and would provide a surface area of 900 acres. Cost estimates were made for structures providing 3 inches, 6 inches and 10 inches of storage at spillway crest elevation. Data for the three scales of development are shown in table B-28.

13. POTENTIAL FOR DEVELOPMENT

The recreation task group considered that scenic attractiveness of the stream valley and proximity to Letchworth State Park would make Angelica reservoir a high quality site for outdoor recreation capable of attracting annual visitation of 288,000 persons. The fish and wildlife task group estimated that, with limited drawdown, fishing potential would be 72,000 fisherman-days annually. Power benefits, contingent upon development of power at Portage project on the Genesee River downstream from Angelica Creek, would not be significant. Flood control, with maximum potential benefits of $12,600 annually would not be incrementally justified for the storage required. In accordance with the considerations for project formulation discussed in Section IV paragraphs 1-3 above, neither municipal and industrial water supply nor irrigation water supply were found to constitute a basis for project authorization at this time. A portion of the water quality control storage for Avon, Gates-Chili-Ogden, and Rochester reaches of the Genesee River could be provided by Angelica site and benefits were estimated for this purpose based on the ratio of available storage to the total storage required. It was assumed for this evaluation that the additional storage needed to meet water quality goals would be provided elsewhere in the basin.

14. MULTIPLE-PURPOSE PLANS CONSIDERED

Evaluation of a multiple purpose reservoir for water quality control, recreation and fish and wildlife enhancement showed that the most favorable development for an ungated spillway structure would be obtained with the site developed to maximum scale. Benefit-cost ratio would be 0.5 as shown in table B-34 below.

Although project data were obtained in detail only for an ungated structure, it was considered desirable to investigate site potential with a gated spillway structure. Cost data were based on curves using estimates of cost made for preliminary studies. For a structure with a gated spillway, serving the same purposes as the ungated structure but with water quality storage reduced to that available between spillway crest and top of gates, the largest benefit-cost ratio of 0.7 was also obtained with maximum site development. Recreation attendance was based on average pool areas for water quality and minimum recreation pools while facilities costs were based on development for attendance with the maximum pool. Data are summarized in table B-34.

Table B-34. Angelica site, multiple purpose plans

	Gated spillway 16" storage (1)	Uncontrolled spillway 10" storage (2)
Top of embankment elev. - ft	1,600	1,600
Top of gates elev. - ft	1,590	-
Capacity - acre - ft	45,700	-
Spillway crest elev. - ft	1,574	1,574
Water quality storage - acre - ft	16,900(3)	20,000(3)
Min. recreation pool elev. - ft	1,574	1,540
Pool area - acres	870	320
Capacity - acre - ft	28,800	8,800
Recreation - annual visitor-days	332,000	190,000
General recreation benefits	$249,000	$143,000
Fishing - annual fisherman-days	82,500	47,500
Fishing benefits	$435,000	$251,000
Water quality control benefits	$ 92,000	$108,000
Total annual benefits	$776,000	$502,000
Dam and reservoir - annual charges	$930,000	$850,000
Recreation facilities-annual charges	179,000	134,000
Total annual charges	$1,109,000	$984,000
Benefit Cost ratio	0.7	0.5

(1) At top of gates
(2) At spillway crest
(3) Includes losses and storage for 10 c.f.s. minimum release

Results of these studies show Angelica project to be unfeasible for multiple purpose use at this time and no further evaluation was made for possible authorization.

15. SINGLE-PURPOSE RECREATION PLANS

Because of the high quality potential of Angelica site as determined by the recreation task group, further evaluation was made for both gated and ungated spillway structures to serve recreational use only. Maximum development was found to provide highest benefit-cost ratios for either structure with a range between 0.3 and 0.6 for the ungated spillway and between 0.5 and 0.7 for the gated spillway. Data for plans providing highest ratios are shown in table B-35.

Table B-35. Angelica site, recreation plans

Item	Gated spillway 16" storage (1)	Uncontrolled spillway 10" storage (2)
Top of embankment elev. - ft	1,600	1,600
Top of gates elev. - ft	1,590	-
Capacity - acre ft	45,700	-
Spillway crest elev. - ft	1,574	1,574
Capacity - acre - ft	28,800	28,800
Low flow storage - acre - ft (3)	4,000	4,000
Max. recreation pool elev. - ft	1,590	1,574
Pool area - acres	1,200	870
Min. recreation pool elev. - ft	1,587	1,569
Pool area - acres	1,140	790
Recreation - annual visitor-days	384,000	288,000
General recreation benefits	$ 288,000	$216,000
Fishing - annual fisherman-days	95,800	72,000
Fishing benefits	$ 505,000	$380,000
Total annual benefits	$ 793,000	$596,000
Dam and reservoir - annual charges	$ 930,000	$850,000
Recreation facilities-annual charges	$ 177,000	$134,000
Total annual charges	$1,107,000	$984,000
Benefit-cost ratio	0.7	0.6

(1) At top of gates
(2) At spillway crest
(3) For losses and 10 c.f.s. minimum release

TUSCARORA PROJECT

16. GENERAL

Keshequa Creek joins Canaseraga Creek near Sonyea, New York, at a point about four miles above the confluence of the latter stream with the Genesee river. Tuscarora site is located on Keshequa about two miles above Sonyea and approximately the same distance downstream from Tuscarora, New York. Drainage area at the site is 69 square miles. The dam would be a concrete structure with maximum height of 145 feet and there would be a low rolled earth embankment at the left abutment. The spillway would be concrete founded on rock and controlled by crest gates. At spillway crest pool, the reservoir would be about four miles long with a maximum width of one-half mile, and would provide a surface area of 660 acres. Although originally eliminated during preliminary studies because of limited potential for multiple-purpose use, relatively low cost per unit of storage and favorable evaluation for recreation and fishing usage indicated that further analysis of the project should be undertaken. Consequently, designs and cost estimates were made for site development providing 7-1/2 inches of storage, and 13 inches of storage, at maximum controlled pool. Data are shown in table B-29.

17. POTENTIAL FOR DEVELOPMENT

Considered for flood control, virtually all usable storage at the site would be required to realize significant damage reduction downstream and project justification could not be achieved for this purpose. However, it was considered desirable to include a minimum amount of flood control storage in any plan for regulation of frequent small floods in the interest of downstream fisheries and the Canaseraga project. Flood control storage of 4,000 acre-feet assumed to provide about $2,000 in annual benefits was used in each plan, and while incremental justification is doubtful, and detailed analysis was not made, the assumption was not found to be critical in justification studies. Water quality control benefits for improvement of downstream reaches on the main river were estimated on the same basis as for Belfast and Angelica projects--that is, that benefits would accrue in proportion to storage provided at the site in comparison with the total storage required to meet the control objectives. Recreation and fish and wildlife benefits and costs were estimated by the Corps of Engineers based on data presented in the relevant appendices. Adjustments were made to

reflect adverse effects where drawdown conditions were significantly different from those assumed in the appendices. In accordance with the discussion presented for the Angelica project, no other project purposes were considered for the Tuscarora project.

18. MULTIPLE-PURPOSE PLAN

A plan to provide storage for water quality control, flood control and recreation was evaluated for each of the two scales developed for the project. In each instance, a minimum constant release of 10 cfs from the reservoir was provided. Storage of 4,000 acre-feet would be needed for this purpose for which no specific benefits were evaluated. The mean pool area between top of joint use pool and minimum recreation pool was used to evaluate general recreation and fishing. The smaller scale project was found to provide a benefit-cost ratio of 0.6 and, for the larger scale project, the ratio was 0.8. A summary of the evaluation of the latter scale is included in table B-36 below.

19. SINGLE-PURPOSE RECREATION PLAN

The plan considered as single-purpose recreation differed from the multiple-purpose plan only in the omission of storage for the purpose of water quality control. In effect, the maximum recreation pools for each project scale remained the same as those for the corresponding scale in the multiple-purpose plan. Minimum pool, however, increased to reflect only the drawdown necessary to provide the minimum reservoir release. Benefit-cost ratio for the smaller scale project would be about 0.9 and would be 0.99 for the larger project. Data for the larger project are shown in table B-36.

Table B-36. Summary of plans, Tuscarora site

	13" Total Storage (1) Multiple-purpose	Single-purpose
Top of embankment elev. - ft.	820	820
Top of gates elev. - ft.	810	810
Capacity - acre-ft.	46,000	46,000
Spillway crest elev. - ft.	784	784
Flood control storage - acre-ft.	4,000	4,000
Top of joint-use pool elev. - ft.	806	-
Low flow storage - acre-ft.	22,000 (2)	4,000 (3)
Max. recreation pool elev. - ft.	806	806
Capacity - acre-ft.	42,000	42,000
Pool area - acres	940	940
Min. recreation pool elev. - ft.	778	802
Capacity - acre-ft.	20,000	38,000
Pool area - acres	580	900
Flood control annual benefits	$ 2,000	$ 2,000
Water quality control annual benefits	$ 98,000	-
Recreation attendance - annual visitor-days	243,000	290,000
General recreation benefits	$182,000	$218,000
Fishing attendance - annual fisherman-days	60,000	92,000
Fishing benefits	$318,000	$496,000
Total annual benefits	$600,000	$716,000
Dam and reservoir-annual charges	$590,000	$590,000
Recreation facilities-annual charges	$114,000	$136,000
Total annual charges	$704,000	$726,000
Benefit-cost ratio	0.85	0.99

(1) Storage below top of gates
(2) Storage for water quality control and minimum reservoir release plus losses.
(3) Storage for minimum reservoir release plus losses.

Multiple-purpose development of Tuscarora site is seen to be economically unfeasible at this time and more detailed evaluation is not indicated. A project oriented primarily to recreational development is seen to be marginal, but further evaluation would only be appropriate for an agency or level of government authorized to undertake projects of this nature.

PORTAGE PROJECT

20. GENERAL

Portage reservoir would be created by construction of a dam at Portageville, New York, at about Genesee River mile 86.5 and approximately 2-1/2 miles above the point reached by full pool in the existing Mt. Morris reservoir. The dam would be a concrete gravity structure 115 feet high with a gated overflow spillway section. Drainage area at the site is 985 square miles. At maximum scale considered, the reservoir full pool would be 17 miles long and would contain 283,000 acre-feet of storage, equivalent to about 5-1/2 inches of runoff on the drainage area. Recreational development was recommended by the outdoor recreation task group, and the fish and wildlife task group estimated potential annual visitation to be highest of any major site in the basin. However, total benefits from fishing would be relatively low based on unit values for a warm-water fishery. Pumped storage hydroelectric power development was indicated to be economically feasible by the power task group report. The project could also provide flow augmentation for water quality improvement in Genesee River reaches below Avon, below the Gates-Chili-Ogden sewage treatment plant above the Barge Canal, and below the Eastman Kodak Company outfall in Rochester, all as discussed in Appendix H. Water for supplemental irrigation of Ontario Lake Plain Lands, to be delivered via the Genesee River and Barge Canal, was cited as a potential need in Appendix J. Municipal and industrial water supply for metropolitan Rochester, to be taken from the river near Avon, was suggested for consideration by the New York State Conservation Department but was not recommended for study by the water supply task group. Comparison of potential benefits and costs derived for the preliminary analysis showed that maximum net benefits would be obtained from a multiple-purpose plan based primarily upon recreation and hydroelectric power with secondary consideration only for water quality, generally resolvable by more economical means than storage; and for irrigation, considered to represent potential demand but requiring further development of Department of Agriculture programs. Although power studies were essentially single-purpose oriented, recreation requirements, minimum releases for the falls in Letchworth State Park, and scenic values in the park were fully recognized. Therefore, the operating plan developed in the power appendix involved conversion of a portion of Mt. Morris reservoir flood control storage to a joint-use permanent pool for power and recreation, with a consequent transfer of flood control storage to Portage reservoir, and was used as the basis for final formulation of a multiple-purpose project at Portage site.

a. Scale of development. Design and cost data were prepared for reservoirs with 2 inches, 3-1/2 inches and 5-1/2 inches of storage on the drainage area or 103,000 acre-feet, 182,000 acre-feet and 283,000 acre-feet at top of gates, respectively, as shown in table B-30. Curves of first cost and annual charges for dam and reservoir are shown on figure B-6. The smaller reservoirs could not provide the flood control storage required to be transferred from Mt. Morris reservoir and were used primarily as indices of cost for single-purpose alternative projects in derivations of benefits. A reduction in storage from the 5-1/2 inch capacity reservoir would reduce the head available for power, would reduce normal and minimum recreation pool areas, and would increase pool fluctuations during high-flow and low-flow periods. For operating plans considered, a reservoir with slightly less than 5 inches of capacity would be necessary in the critical year of record to assure that a usable pool could be maintained above the estimated 100-year sediment storage pool and still meet downstream flow commitments. Incremental savings possible in dam and reservoir costs for any practical degree of reduced storage below 5-1/2 inches were not considered to warrant further refinement of the project scale in a survey scope study. Therefore, controlling elevations established in power plan C of Appendix L with normal joint-use pool at spillway crest elevation 1,160 feet, and as further documented below, were adopted for evaluation of Portage project.

b. Operating plans considered. The basic plan of operation, developed for the power study, included a normal joint-use pool for recreation and power at Portage spillway crest elevation 1,160 feet, a minimum release of 225 cfs during daylight hours (equivalent to a mean daily discharge of about 170 cfs) for the falls in Letchworth Park, a lower pool in Mt. Morris reservoir at elevation 697 feet for recreation and pumped storage power operations, and replacement flood control storage in Portage reservoir for equivalent storage lost in Mt. Morris reservoir by creation of the permanent pool. Flow diversion for power would enter an intake structure located in the Portage pool above the dam and would be conveyed by tunnel to an underground powerhouse excavated in rock. A tailrace tunnel would extend from the powerhouse to the Mt. Morris pool. Reversible pump-turbine units in the powerhouse would allow pump-back operation from Mt. Morris reservoir into Portage reservoir during off-peak hours. Minimum release to the lower river of 160 cfs from Mt. Morris Dam would be approximately equivalent to the 170 cfs release from Portage project, less losses, and the result would be a normal daily Mt. Morris pool fluctuation of less than two feet from power operations. After 1 October each year, Portage reservoir would be drawn below normal summer pool to reduce pumping

energy requirements. Computer routings of monthly flows for the 56 years of record showed that the reservoir would refill each year. The basic operating plan was modified into four plans providing additional releases upon demand, or continuously, depending on objectives. These objectives were as follows:

Plan 1 - Power, recreation, water quality (Avon and Gates - Chili - Ogden reaches)

Plan 2 - Power and water quality (Rochester reach)

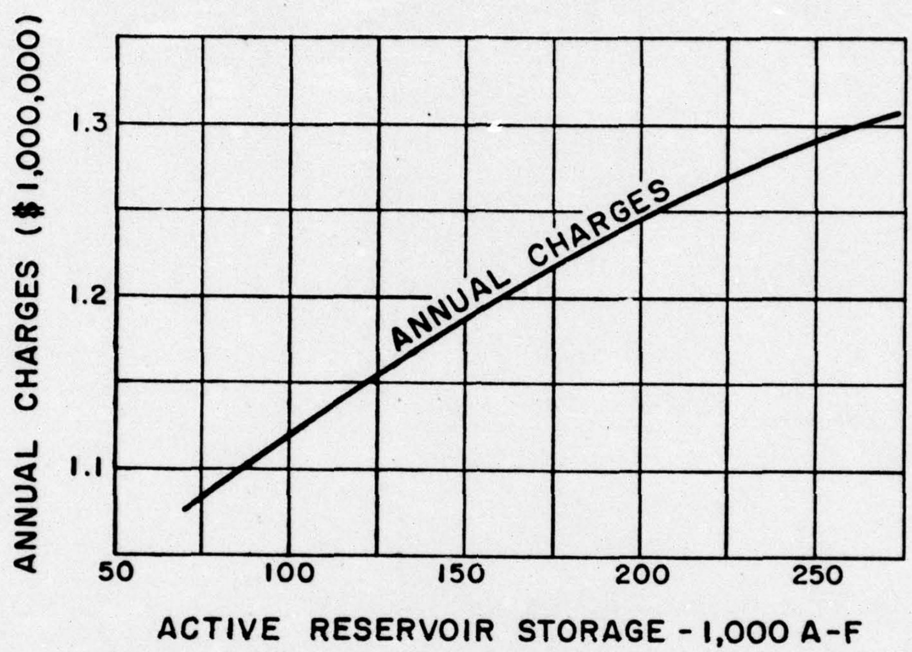
Plan 3 - Power, irrigation (185 cfs in July and August), water quality (Avon, and Gates-Chili-Ogden reaches), recreation

Plan 4 - Power, (water supply (160 mgd), irrigation (75 cfs in July and August)

With program adaptations to meet the above objectives, routings of monthly flows were made using the 56 years of record at Portageville gage and synthesized inflows to the Genesee River below Mt. Morris Dam. Resulting end-of-month elevations of Portage reservoir for the critical year and elevations equalled or exceeded in 90 percent of the months routed are shown on figure B-7 for each plan.

c. Conclusions. The duration and severity of drawdown in plans 2 and 4 were judged by the outdoor recreation task group to be so adverse for recreational purposes that only minimum development would be undertaken and the loss in annual benefits, net of costs of facilities, was estimated at $989,000 based on recreational development proposed for plan 1. Plan 2, which could provide total gross benefits for water quality of $656,000 based on the cost of advanced treatment or waste diversion alternatives for the three river reaches requiring improvement, would therefore produce less net benefits than plan 1. Plan 4, while found capable of providing dependable water supply of 160 mgd at a cost approximately equal to that for the alternative Lake Ontario source, would draw this water from the Genesee River at Avon, New York, and return flows would be discharged to Lake Ontario in Rochester disposal system outfalls. The diversion would be equivalent to a consumptive loss of 160 mgd for the lower river from Avon to Lake Ontario. This factor, together with the adverse opinion of the recreation task group and the judgement of the water supply task group that metropolitan Rochester would utilize Lake Ontario in preference to other sources, led to the conclusion that study of plan 4 should be terminated without further evaluation. Plan 3 would be essentially the same as plan 1 with additional releases

PORTAGE DAM AND RESERVOIR
ANNUAL CHARGES AND FIRST COST



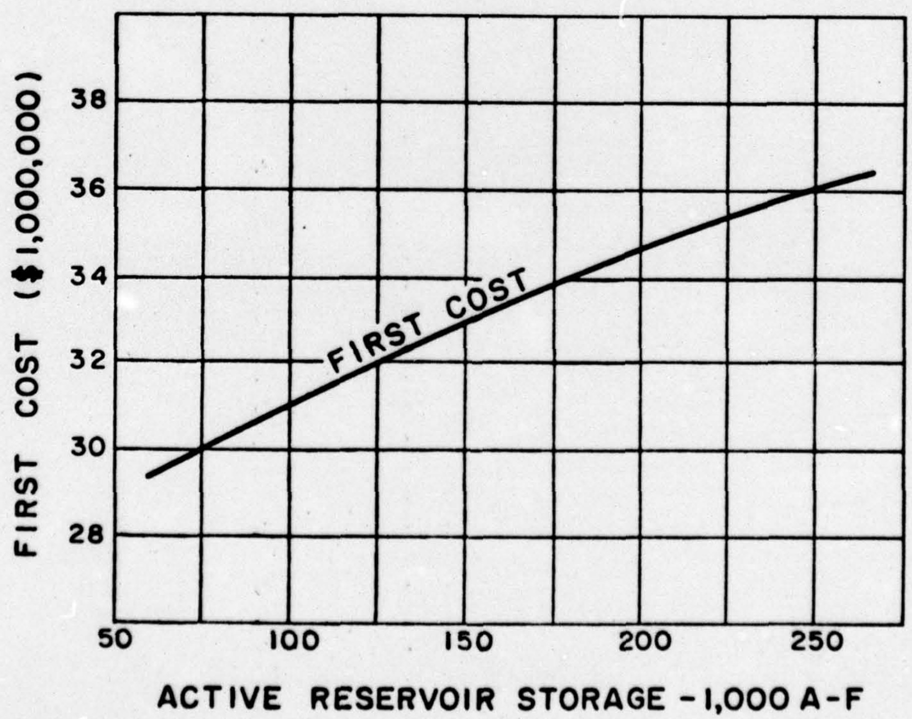


FIGURE B6

PORTAGE RESERVOIR OPERATING PLANS

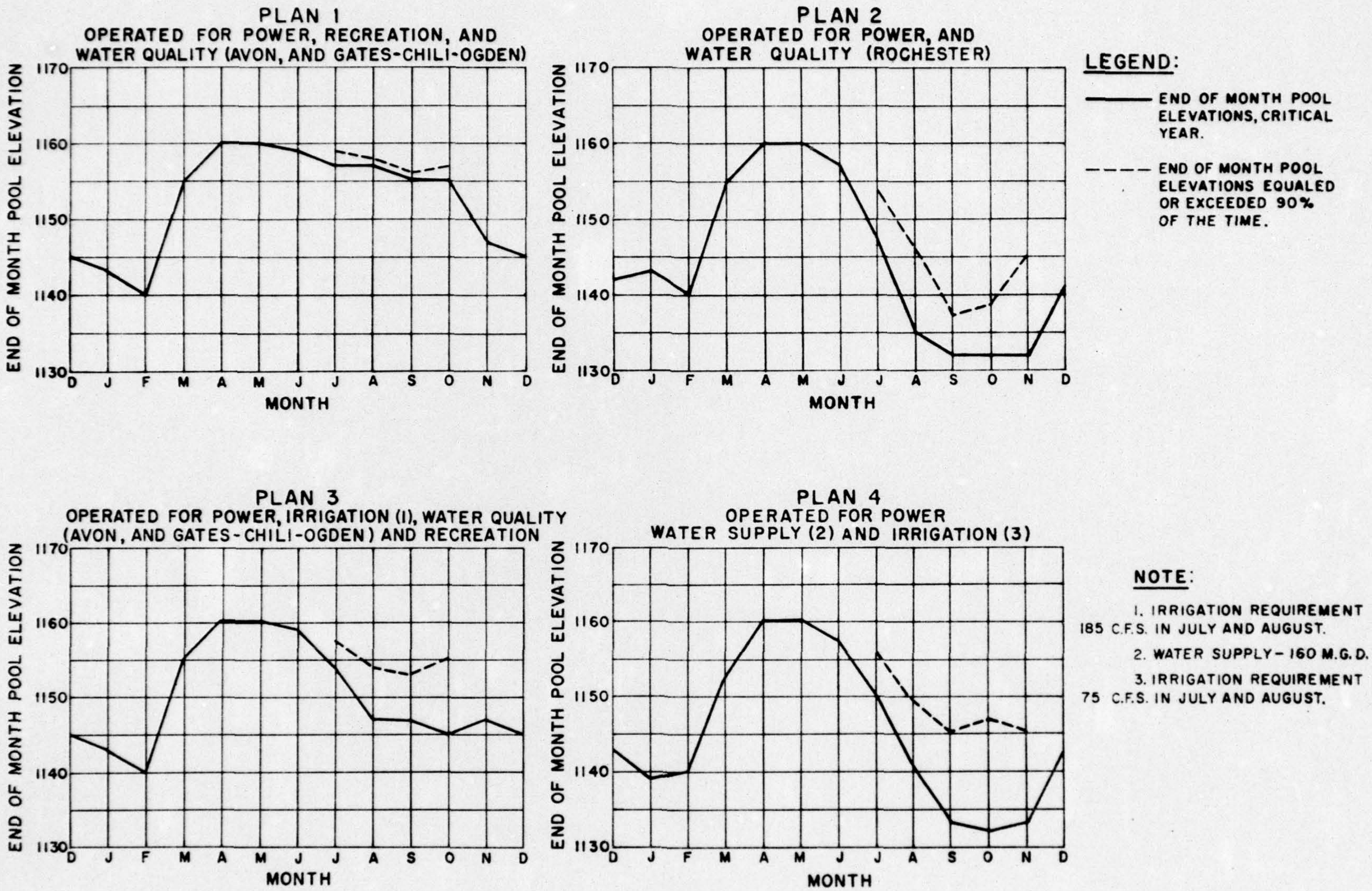


FIGURE B7

FIGURE B7

of 185 cfs made during the months of July and August for irrigation. This water would be withdrawn from the Barge Canal for application to lands in the Ontario Lake Plain and replaced by Genesee River flows into the canal pool above Court Street Dam in Rochester. As indicated in previous discussions of irrigation, provision of water would be contingent upon future activation of demand resulting from continued growth in the practice of irrigation on the Lake Plain. Plan 3, therefore, represents a possible future operating modification of plan 1, and as such, was not concluded to require more detailed evaluation for this report. Further study of Portage project was confined to plan 1 at the development scale discussed in paragraph 20b above. See Figure B8 following page IV-B41 for proposed Portage reservoir development.

21. POWER DEVELOPMENT

Four plans for the development of hydroelectric power at Portage site were considered in the studies described in Appendix L. Two plans were based on conventional power operation with the first assuming a permanent pool in Mt. Morris reservoir and the second assuming that Mt. Morris would be operated solely for flood control as in the present operating system. Two additional plans based on reversible pump storage units utilizing a permanent lower pool in Mt. Morris reservoir were also studied. The first of the pumped storage plans was of the integral type with Portage reservoir serving as upper pool. The second plan was of the adjoining type with an upper reservoir to be constructed on the left bank of the river and lying immediately outside Letchworth Park limits. Of the plans considered, only the integral type of pumped storage development was indicated to be capable of meeting the required tests of feasibility. In further studies, effects on existing downstream hydroelectric power plants were also investigated.

a. <u>At-site power</u>. Formulation studies made for Appendix L showed that, while net power benefits increased with increased capacity, the comparability ratio (based on costs for power from an alternative Federally-financed steam plant) would fall below unity when capacity rose above about 200 megawatts, due to increased requirements for pumping energy and the low incremental savings in facility costs for the increases in capacity above the 200 megawatt figure. Because of the relationship between power values and estimated costs per kilowatt of capacity, both the benefit-cost ratio and the comparability ratio were found to change little over the practicable range of capacities considered, as shown on figure 4 of Appendix L. Monthly flow routings for the adopted plan were made for installed capacities between 125 and 300 megawatts, but it became evident that relatively

small changes in cost relationships, which could be expected to occur by the time advanced planning might be initiated, would make additional refinement in the present study largely academic. Such refinement was, therefore, not undertaken and the 200 megawatts of capacity selected from Appendix L studies was used for the adopted plan. Energy generated and pumping energy requirements were revised to reflect results of flow routings for the multiple-purpose plan made subsequent to Appendix L studies. Significant features of the plan for hydroelectric power development at the Portage site are given in table B-37.

TABLE B-37. Power features, Portage project

	Unit	Quantity
Type of development	-	Pumped storage, integral
Number of units	each	2
Maximum gross head	ft.	464
Minimum gross head	ft.	443
Average gross head	ft.	460
Design power discharge	cfs.	6,500
Intake tunnel diameter	ft.	18
Tailrace tunnel diameter	ft.	25
Installed capacity	kw	200,000
Generating cycle	-	6 hours/day, 5 days/week
Nominal plant factor (annual)	o/o	18
Average plant factor (annual)	o/o	21
Average annual energy	mwh	412,400
Average annual pumping energy	mwh	209,200

Total first cost of specific power facilities was taken from Appendix L and is shown in table B-38.

TABLE B-38. Cost estimate, pumped storage Plan C

Description	Quanity	Unit	Unit Price	Amount
			$	$
Power Plant				
Access shaft (35 ft. I.D.)	380	LF	4,913.00	1,867,000
Access building	-	LS	-	396,000
Elevator	-	LS	-	200,000
Powerhouse and excavation	64,500	CY	18.50	1,193,000
Substation and equipment	-	LS	-	1,090,000
Total power plant				16,946,000
Waterways				
Intake structure and appurtenances	-	LS	-	1,746,000
Intake access road	-	LS	-	115,000
Power tunnel (18 ft. I.D.)	3,500	LF	860.00	3,010,000
Tailrace tunnel (25 ft. I.D.)	5,000	LF	1,460.00	7,300,000
Tailrace surge chamber	-	LS	-	1,090,000
				13,371,000
Total (less contingencies)				30,317,000
Contingencies (25%)				7,583,000
Estimated contractor's earnings plus contingencies				37,900,000
Engineering and design, supervision & administration				6,600,000
Total first cost				44,500,000

Average annual charges for power and at-site benefits were computed as follows:

First cost ($1,000)	$44,500
Interest during construction - 4 years @ 3-1/4% ($1,000)	2,900
Investment ($1,000)	47,400
Annual charges ($1,000)	
Interest - 3-1/4 percent	1,540
Amortization - 3-1/8%, 100 year life	65
Interim replacements - 0.20% of invest.	95
Major replacements - (1)	111
Operation and maintenance - (2)	462
Administration and general - 35% of O&M	162
Sub total	2,435
Pumping energy - 209,200 mwh at $3/mwh	628
Total annual charges	3,063
Annual benefits ($1,000)	
Capacity - 200,000 kw at $19.00/kw	3,800
Energy - 412,400 mwh at $2.30/mwh	949
Total annual at-site benefits	$ 4,749

(1) Computed as 0.42 percent of investment in power plant with cost of waterways excluded.

(2) Based on curves derived for Appendix L.

Costs as shown above do not reflect incremental costs for Portage reservoir which result from requiring Mt. Morris pool to be at elevation 697 feet for pump-back to Portage pool rather than at elevation 680 feet which would be sufficient for water-oriented recreation in Letchworth Park. The higher pool requires additional storage in Portage to replace flood control storage displaced in Mt. Morris reservoir. Incremental first cost for this storage would be $70,000 for lands and $650,000 for dam and reservoir. Routings made subsequent to the computations for Appendix L also showed that elimination of the provision for the 225 cfs over the falls in Letchworth Park would decrease the annual cost of pumping energy by $180,000. This cost for esthetic values to sightseers was therefore considered chargeable to recreation in the economic analysis and cost allocation studies. The incremental cost of storage was considered a specific cost of power. Adjustments of

first costs, investment and annual charges due to these factors will be found in the appropriate paragraphs below.

b. Downstream power. There are four existing hydroelectric plants on the Genesee River located below Mt. Morris Dam and all are owned by Rochester Gas and Electric Corporation. Station 160, with installed capacity of 340 kw, is located about one mile below the dam and could continue to function with the operating plan adopted for the Portage-Mt. Morris system as described above. Because of the small capacity, average annual plant factors were not computed nor evaluated for the changed operating system. Stations 2, 5 and 26 are located on the river at and below Court Street Dam in Rochester and have installed capacities of 6,500 kw, 38,250 kw and 3,000 kw, respectively. During the navigation season on the Barge Canal which generally extends from May through November each year, canal waters surplus to navigation needs are diverted to the lower Genesee River and are purchased from the State of New York by the power company for power generation in the three plants. Prior to 1949, the surplus flow available for diversion was estimated to average about 600 cfs. Since that year, changes in the canal operation have reduced the surplus to an average of about 375 cfs and payment by the corporation is presently based on the lower diversion. Plant factors for the three plants were computed from the average annual energies generated in the years 1937 through 1956 and were compared with plant factors derived from the discharge-duration curve of recorded Rochester flows in the corresponding period. From this comparison, a constant factor was obtained for each plant which could be used to correct load factors computed from discharge-duration relations to values consistent with those based on energy generation in the above referenced period. Two additional discharge-duration curves were then developed for the Rochester gage at Driving Park Avenue using the period covering the 56 years of record at the Portageville gage. The first of these curves was developed with the assumption that the canal surplus was reduced from 600 cfs to 375 cfs during the navigation season in the period 1918 to 1949. Corrected plant factors and annual energy resulting were estimated to represent long term average annual values for present conditions. The second discharge-duration curve was derived from Rochester discharges obtained by routing monthly flows through Portage and Mt. Morris reservoirs using the proposed operating plan for the two-reservoir system. Corrected load factors computed from this curve were used to obtain average annual energy obtainable at the downstream plants and the increased energy was credited to Portage project. Results are summarized in table B-39.

TABLE B-39. Downstream energy

		Station 2	Station 5	Station 26
Installed Capacity	kw	6,500	38,250	3,000
Dependable Capacity: March-April (1)	kw	7,000	40,000	1,000
Other Months	kw	7,600	42,000	3,000
Usable flow: Plant	cfs	1,300	4,300	1,800
Cooling water priority	cfs	300	-	-
Losses	cfs	-	-	62
Total	cfs	1,600	4,300	1,862
Recorded flows at Rochester: 1937 - 1956 (incl.)				
Avg. annual energy	mwh	43,700	157,000	14,560
Avg. plant factor (2)	percent	66.5	42.9	62.5
Computed plant factor (3)	percent	75.1	47.6	74.1
Correction factor	constant	0.885	0.90	0.843
Adjusted record at Rochester: 1909 - 1965 (incl.) (4)				
Computed plant factor (3)	percent	73.8	48.8	73.5
Corrected plant factor	percent	65.3	43.9	62.0
Avg. annual energy	percent	42,900	161,000	14,400
Monthly flow routed through Portage and Mt. Morris: 1909 - 1965 (4)				
Computed plant factor (3)	percent	76.5	50.5	76.0
Corrected plant factor	percent	67.6	45.5	64.1
Avg. annual energy	percent	44,500	166,500	14,900

(1) Capacity reduced by high tailwater condition.
(2) Based on average annual energy generated.
(3) Based on usable flow and discharge - duration curve.
(4) Assuming canal diversion reduced to 375 cfs during navigation season before 1949.

Average annual energy generation under present conditions, represented by the adjusted record at Rochester in the above tabulation, and that obtainable with regulation by Portage and Mt. Morris reservoirs would be as follows:

	Present Conditions	Regulation
	Energy in mwh	
Station 2	42,900	44,500
Station 5	161,000	166,500
Station 26	14,400	14,900
Total	218,300	225,900

Increase due to regulation: 7,600

Using the Portage energy value of 2.3 mills per killowatt, the increased energy would represent a benefit of $17,500 annually.

22. RECREATION, FISH AND WILDLIFE

a. Outdoor recreation. Operated in conformance with plan 1 as described above, Portage reservoir was considered by the recreation task group to have the greatest potential for outdoor recreation of any major site studied. The surface area would be largest of any site considered, and because of location, the reservoir would complement the scenic attractiveness of the gorge and river cataracts in Letchworth Park. The permanent pool to be maintained in Mt. Morris reservoir would offer some water-oriented recreation but because of the sheer cliffs in the river gorge and difficulty in access, recreation use would be limited to sight-seeing craft and canoes. Key activities in the recreation development of Portage reservoir would be boating, camping, picnicking and swimming. Secondary activities recommended for development by the recreation task group would include horseback riding, hiking trails, games and sports, fishing, hunting and nature study. Potential of a combined Letchworth-Portage recreation area to satisfy greater regional as well as local needs was considered to establish the Portage project as the focal point of the outdoor recreation plan for the river basin. Quality of the resource and potential for development were also considered to make the project of national significance for outdoor recreation.

b. Attendance. Assuming project completion by the year 1980, the recreation task group estimated that the 4,000 acres of water surface, combined with development of a recreational preserve of about 16,000 acres, would attract an annual visitation of 1,400,000 recreationists with a daily capacity of 32,000 persons. In the succeeding 40 years with continued development of facilities, maximum annual capacity of 2,000,000 visitor-days would be reached and daily capacity would be 47,000 visitors. Initial project studies by the Corps of Engineers included 2,000 acres of land for recreational development. For this scale of development, the recreation task group estimated that initial attendance would total 400,000 visitor-days and that the ultimate attendance would be 550,000

visitor-days, to be reached in 20 years after project completion. Limited recreational use of the permanent pool in Mt. Morris reservoir within Letchworth Park would become possible upon construction of the Portage project and was estimated to provide 9,200 recreation-days by conoeists and 78,000 trips by sightseers in a cruise-boat operation. Benefits therefrom, were attributed to Portage project and costs were assumed to be self-liquidating in the economic analysis discussed below.

c. Fish and wildlife. As a warm-water fishery, Portage reservoir was estimated by the fish and wildlife task group to be capable of providing 400,000 annual fisherman-days of use. This capacity would be reached in the first year after project completion and no additional growth in annual attendance for fishing would be anticipated. Of the 400,000 visitors drawn to the project primarily for the fishing opportunity, a portion would also participate in other activities to an extent estimated to be equivalent to 50,000 recreation-days of general outdoor recreation use. In the economic evaluation discussed below, general outdoor recreation benefits for these 50,000 recreation-days were attributed to fish and wildlife. Costs of facilities other than for fishing, were included in general recreation facilities costs. Use by fishermen was estimated to be the same for either the minimum or recommended areas of land to be provided for recreational purposes.

d. Recreation lands. Preliminary analysis by the Corps of Engineers indicated that an area of 2,000 acres should be provided for minimum recreational development. This area would be in addition to 4,100 acres at normal pool elevation, plus 2,400 acres to flood control pool elevation, plus 1,000 acres for control of access based on 300-foot horizontal dimension from flood control pool elevation or at least 5 feet vertically from the same elevation. Minimum total project acreage would thus be 7,500 acres for the reservoir pool plus 2,000 acres specifically for recreation. Estimated land costs were as follows:

Pool area	7,500 acres	$3,125,000
Min. recreat. lands	2,000 acres	615,000
Added recreat. lands	10,600 acres	1,100,000
Total	20,100 acres	$4,840,000

The relatively low cost for the added recreation lands results from the location which is generally above the fertile bottom lands and includes steep, wooded hillsides not susceptible to economical development for present land use patterns in the area. A preliminary analysis of recreation costs and benefits for the minimum and recommended land requirements produced results summarized in table B-40.

TABLE B-40. Recreation lands

	Minimum development	Recommended development
Land area - acres	2,000	12,600
First cost for land - $1,000	615	1,715
Initial annual visitation		
General recreation - 1000 vis.-days	400	1,400
Fishing - 1,000 fisherman-days	400	400
Ultimate annual visitation		
General recreation - 1,000 vis.-days	550 (1)	2,000 (2)
Fishing - 1,000 fisherman-days	400	400
Est. avg. annual benefits - $1,000 (3)	1,041	2,875
Est. avg. annual costs - $1,000 (4)	434	1,315
Excess benefits - $1,000	607	1,560

(1) Growth period of 20 years.
(2) Growth period of 40 years.
(3) Discounted for growth period.
(4) Specific costs for recreation, discounted for growth period.

Further study of the project was based on the acreage recommended by the recreation task group.

e. Benefits and costs. Recreation benefits attributed to the Portage project were confined to at-site visitation, assigned a value of $1.50 per visitor-day; and to the canoeing and cruise-boat opportunity provided in Mt. Morris reservoir which were assigned values of $1.50 per person and $1.00 per person, respectively. Benefits for fishing in Portage reservoir were valued at $0.50 per fisherman-day. Increased quality and quantity of recreation usage of the river below Mt. Morris which might result from flow regulation provided by the proposed operating plan were recognized by the recreation task group but were not given monetary evaluation. A summary of general recreation and fishing benefits is given in table B-41.

TABLE B-41. Recreation benefits

	Initial	Future increment	Future increment discounted	Total
Annual attendance	. . . 1,000	visitor-days . . .	. . .	. .
General recreation (1)	1,400	600	-	2,000
Fishermen	400	-	-	400
Canoeing (2)	7.4	-	-	7.4
Cruise boat (2)	78	-	-	78
Annual benefits	. . . $1,000	. . .	. . .	. .
General recreation	$2,100	$900	$500(3)	$2,600
Fishing (4)	275	-	-	275
Total, at-site	2,375	900	500	2,875
Canoeing	11	-	-	11
Cruise boat	78	-	-	78
Total benefits	$2,464	$900	$500	$2,964

(1) Excluding equivalent of 50,000 recreation-days by fishermen.
(2) At Mt. Morris reservoir.
(3) Discounted at 3-1/4 percent for straight line growth over 40 years in 100-year life.
(4) Includes general recreation benefits of $1.50 per day for 50,000 user-days by fishermen.

Costs of specific facilities to accommodate expected visitation were estimated by the recreation task group and are discussed in Appendix M. Costs for specific facilities to serve fishermen were provided by the fish and wildlife task group for use in formulation studies. First costs and investment for recreation facilities, including lands, are summarized on table B-42.

TABLE B-42. First cost of recreation facilities

	Initial	Future Increment	Future increment discounted	Total
	Costs in $1,000			
General recreation facilities (1)	5,850	2,530	1,400(2)	7,250
Contingencies and overhead (3)	1,170	500	280	1,450
Subtotals	7,020	3,030	1,680	8,700
Lands (12,600 acres) (1)	1,715	-	-	1,715
First cost	8,735	3,030	1,680	10,415
Interest during construction	565	-	-	565
Investment	9,300	3,030	1,680	10,980
Fishing facilities (4)	136	-	-	136
Contingencies and overhead (3)	29	-	-	29
First cost	165	-	-	165
Interest during construction	5	-	-	5
Investment	170	-	-	170
Total first cost (1)	8,900	3,030	1,680	10,580
Total investment	9,470	3,030	1,680	11,150

(1) Rounded from estimated amounts.
(2) Discounted at 3½ percent for uniform expenditure in 40-year growth period.
(3) At approximately 20 percent.
(4) Includes ramps, parking and basic sanitary facilities in 8 units.

Annual charges on recreation facilities costs tabulated above include interest and amortization of investment at 3½ percent over an economic life of 100 years; operation and maintenance estimated at 3 percent of first cost, including land costs, and $0.30 per visitor-day; and major replacements based on replacement of one-third of facilities every 25 years, excluding lands. A summary of estimated annual charges is shown on Table B-43.

TABLE B-43. Annual charges for recreation facilities

	Initial	Future Increment	Future increment: discounted	Total
	. . . . Charges in $1,000			
General recreation:				
Investment	9,300	3,030	1,680	10,980
Interest	302	98	55	357
Amortization	13	4	2	15
O&M	697	271	150	847
Maj. repl.	62	27	15	77
Subtotal	1,074	400	222	1,296
Fishing:				
Investment	170	-	-	170
Interest	5.5	-	-	5.5
Amortization	0.5	-	-	0.5
O&M	8.0	-	-	8.0
Maj. repl.	1.0	-	-	1.0
Subtotal	15.0	-	-	15.0
Total annual charges	1,089	400	222	1,311

23. WATER QUALITY IMPROVEMENT

The adopted plan of operation for Portage project would meet dilution requirements for Genesee River reaches below Avon and below the Gates-Chili-Ogden treatment plant. Based on 85 percent treatment of wastes to the year 1980 and 90 percent or more after that year, gross stream flows in the two reaches to achieve a dissolved oxygen concentration of 4 mg/liter are shown by months in table B-44.

Table B-44. Flow requirements, Avon and Gates-Chili-Ogden

Month	Year 1980		Year 2020	
	Avon	G-C-O	Avon	G-C-O
	. . . . Flow requirements in cfs			
Jan	20	18	20	26
Feb	20	18	20	26
Mar	25	22	25	30
Apr	29	26	29	38
May	57	57	53	82
Jun	77	85	73	134
Jul	93	106	89	166
Aug	89	101	89	158
Sep	89	101	89	158
Oct	61	70	61	110
Nov	41	40	41	62
Dec	29	23	26	34

The minimum release of 160 cfs proposed for Mt. Morris reservoir in the adopted plan plus inflows from the river watershed between

Mt. Morris Dam and Avon would meet the quality requirement without additional drawdown from either Portage or Mt. Morris reservoirs. Based on monthly flow routings of the 56 years of record at Portageville gage and existing operating conditions, 1980 flow requirements would not have been met on two occasions at Avon and on five occasions at Gates-Chili-Ogden. For 2020 requirements, two shortages would have been experienced at Avon and seven shortages would have occurred at Gates-Chili-Ogden. Benefits for meeting the water quality requirements in the two reaches were taken as equivalent to the least costly alternative means of achieving the dissolved oxygen requirement. Annual costs for advanced treatment would be $55,000 at Avon and $101,000 at Gates-Chili-Ogden, a total of $156,000. For the Federal Water Pollution Control Administration criterion of meeting target flows 95 percent of the time, single-purpose storage required for flow augmentation would total 15,000 acre-feet including sediment storage, evaporation and other losses. Least costly storage of this capacity would be obtained from a combination of Upland Reservoir sites 3-3 and 6-5 with costs as follows:

First cost	$3,480,000
Investment (1 year construction period)	3,480,000
Annual Charges	
Interest and amort. (3½%, 100 yr. life)	$118,000
Operation and maintenance	20,000
Total annual charges	$138,000

Water quality improvement benefits were thus assumed to be $138,000 annually for the two reaches.

24. ECONOMIC ANALYSIS

First cost and annual charges for the proposed project involving changed use of Mt. Morris reservoir and a multiple-purpose reservoir at Portage site for the purposes of power, recreation and water quality improvement are summarized as follows:

First cost	
Lands and damages	$ 4,840,000
Dam and reservoir	32,800,000
Power facilities	44,500,000
Recreation facilities	8,865,000
Total	$91,005,000
Interest during construction	5,795,000
Investment	$96,800,000

Annual charges	
Interest (3½ percent)	\$3,146,000
Amortization (100-year life)	134,000
Operation and maintenance	1,481,000
Major replacements	189,000
Administration and general (power)	162,000
Pumping energy	628,000
Total annual charges	\$5,740,000

Average annual benefits from the multiple-purpose project were estimated as follows:

Power: At-site (capacity)	\$3,800,000
(energy)	949,000
Downstream (energy)	17,000
Total power	4,766,000
Recreation: At-site (general)	2,600,000
(fishing)	275,000
	89,000
Total recreation	2,964,000
Water quality	138,000
Total average annual benefits	\$7,868,000

The ratio of benefits to costs for the Portage project would thus be 1.4 to 1.

25. COST ALLOCATION

Allocation of costs for the multiple-purpose features of the Portage project for hydroelectric power, recreation and water quality improvement was made using the separable cost-remaining benefits method. Table B-45 shows first costs and annual charges and the allocation is given in table B-46.

Table B-45 . Summary of first costs and annual charges, Portage project

	Multiple-purpose project					Alternative single-purpose project costs		
	Specific costs							
	Power	Recreation	Water Qual. (1)	Joint	Total	Power (8)	Recreat (9)	Water Qual. (10)
	Amounts in $1,000							
FIRST COSTS								
Lands and damages	70 (2)	1,715	-	3,055	4,840	-	-	-
Dam and reservoir	650 (2)	-	-	32,150	32,800	-	-	-
Power facilities	44,500	-	-	-	44,500	-	-	-
Recreation facilities (3)	-	8,865	-	-	8,865	-	-	-
Totals	45,220	10,580	0	35,205	91,005	-	-	3,480
INVESTMENT								
Interest during const. (4)	2,940	570 (5)	-	2,285	5,795	-	-	0
Investment	48,160	11,150	-	37,490	96,800	-	-	3,480
ANNUAL CHARGES								
Interest (3-1/4%)	1,565	362	-	1,219	3,146	-	-	113
Amortization (100-yr.)	67	15	-	52	134	-	-	5
Operation and maintenance	557 (6)	855	-	69	1,481	-	-	20
Major replacements	111	78	-	-	189	-	-	-
Administration & general	162	-	-	-	162	-	-	-
Pumping energy	448	180 (7)	-	-	628	-	-	-
Totals	2,910	1,490	0	1,340	5,740	2,949	2,740	138

(1) For Genesee River reaches below Avon and Gates-Chili-Ogden outfall.
(2) Incremental cost for flood control storage displaced in Mt. Morris reservoir between elev. 680 and elev. 697 for power.
(3) Includes present worth of future facilities.
(4) Four-year construction period at 3-1/4 percent for all initial facilities.
(5) For initial recreational facilities costs.
(6) Includes interim replacements for power facilities.
(7) Increased cost of pumping energy due to 225 cfs for Letchworth Park falls.
(8) Based on costs for Federally-financed steam alternative.
(9) Single-purpose project at Portage site.
(10) Two alternative Soil Conservation Service reservoirs.

Table B-46. Cost allocation, Portage project

	Power	Recreation	Water quality	Total
	- - -	- - - Amounts:	in $1,000 - -	- - - -
ALLOCATION OF ANNUAL COSTS				
Benefits	4,766	2,964	138	7,868
Alternate Cost	2,949	2,740	138	5,827
Benefits limited by alternate cost	2,949	2,740	138	5,827
Specific cost	2,910	1,490	0	4,400
Remaining benfits	39	1,250	138	1,427
Allocated joint costs	36	1,174	130	1,340
Total allocated cost	2,946	2,664	130	5,740
Comparability Ratio	1.0			
Benefit to Cost Ratio	1.62	1.11	1.06	1.37
ALLOCATION OF OPERATION & MAINT. COSTS				
Specific costs	557	855	0	1,412
Allocated joint cost	2	60	7	69
Total allocated cost, O&M	559	915	7	1,481
MAJOR REPLACEMENTS, ADMINISTRATION AND GENERAL, PUMPING ENERGY-(SPECIFIC COSTS)	721	258	-	979
ALLOCATION OF INVESTMENT (ANNUAL)				
Specific costs	1,632	377	0	2,009
Allocated joint cost	34	1,114	123	1,271
Total annual investment cost	1,666	1,491	123	3,280
ALLOCATION OF INVESTMENT (TOTAL)				
Specific costs	45,220	10,580	0	55,800
Interest during construction	2,940	570	0	3,510
Total specific investment cost	48,160	11,150	0	59,310
Allocated joint facilities cost	950	30,840	3,415	35,205
Allocated joint interest on facilities cost	70	2,000	215	2,285
Total allocated joint investment cost	1,020	32,840	3,630	37,490
GRAND TOTAL ALLOCATED INVESTMENT	49,180	43,990	3,630	96,800
ALLOCATION OF CONSTRUCTION EXPENDITURES				
Construction, specific facilities	45,220	10,580	0	55,800
Construction, joint facilities	950	30,840	3,415	35,205
Total construction expenditures	46,170	41,420	3,415	91,005

26. APPORTIONMENT OF COSTS

Federal costs and the apportionment to non-Federal interests is shown in table B-47. For the cost-sharing as shown, power development was assumed to be a Federal undertaking. Benefits from water quality improvement in the two reaches of the main river are considered widespread and nonreimbursable in accordance with the Federal Water Pollution Control Act Amendments of 1961 (PL 87-88). Cost sharing for recreational features was done in accordance with the Federal Water Project Recreation Act (PL 89-72) and non-Federal interests were assigned one-half of the separable cost allocated to recreation, and all costs of operating, maintenance and replacement of recreation and fish and wildlife lands and facilities.

Table B-47. Cost apportionment, Portage project

	Federal		Non-Federal			
	Cost	Percent	Cost	Percent	Total cost	Percent of total
CONSTRUCTION COSTS						
Power	$ 46,170,000	50.7	-	-	$ 46,170,000	50.7
Recreation						
Separable	5,290,000	5.8	$ 5,290,000	5.8	10,580,000	11.6
Joint	30,840,000	33.9	-	-	30,840,000	33.9
Total	$ 36,130,000	39.7	$ 5,290,000	5.8	$ 41,420,000	45.5
Water quality	3,415,000	3.8	-	-	3,415,000	3.8
Total Construction Costs	$ 85,715,000	94.2	$ 5,290,000	5.8	$ 91,005,000	100.0
ANNUAL O&M COSTS						
Power	559,000	37.7	-	-	$ 559,000	37.7
Recreation	60,000	4.1	$ 855,000	57.7	915,000	61.8
Water quality	7,000	0.5	-	-	7,000	0.5
Total O&M	$ 626,000	42.3	$ 855,000	57.7	$ 1,481,000	100.0
MAJOR REPLACEMENTS; ADMIN. & GENERAL; & PUMPING ENERGY COSTS						
Power	$ 721,000	73.6	-	-	$ 721,000	73.6
Recreation	-		$ 258,000	26.4	258,000	26.4
Total	$ 721,000	73.6	$ 258,000	26.4	$ 979,000	100.0
ANNUAL CHARGES						
Power	$ 2,946,000	51.3	-		$ 2,946,000	51.3
Recreation	1,363,000	23.7	$ 1,301,000	22.7	2,664,000	46.4
Water quality	130,000	2.3	-		130,000	2.3
Total Annual Charges	$ 4,439,000	77.3	$ 1,301,000	22.7	$ 5,740,000	100.0

EVALUATION OF UPLAND RESERVOIR SITES

27. Of the more than 200 structural possibilities investigated in the Genesee River Basin, 35 are proposed for construction. These include three reservoir sites which will provide a measure of flood control and three which will store water for irrigation in the Basin proper. An additional 29 sites are potentially capable of supplying irrigation water in the Ontario Lake Plains Service Area. In total, these irrigation sites will provide water sufficient to irrigate an estimated 14,900 acres of vegetable crop.

28. FLOOD PREVENTION

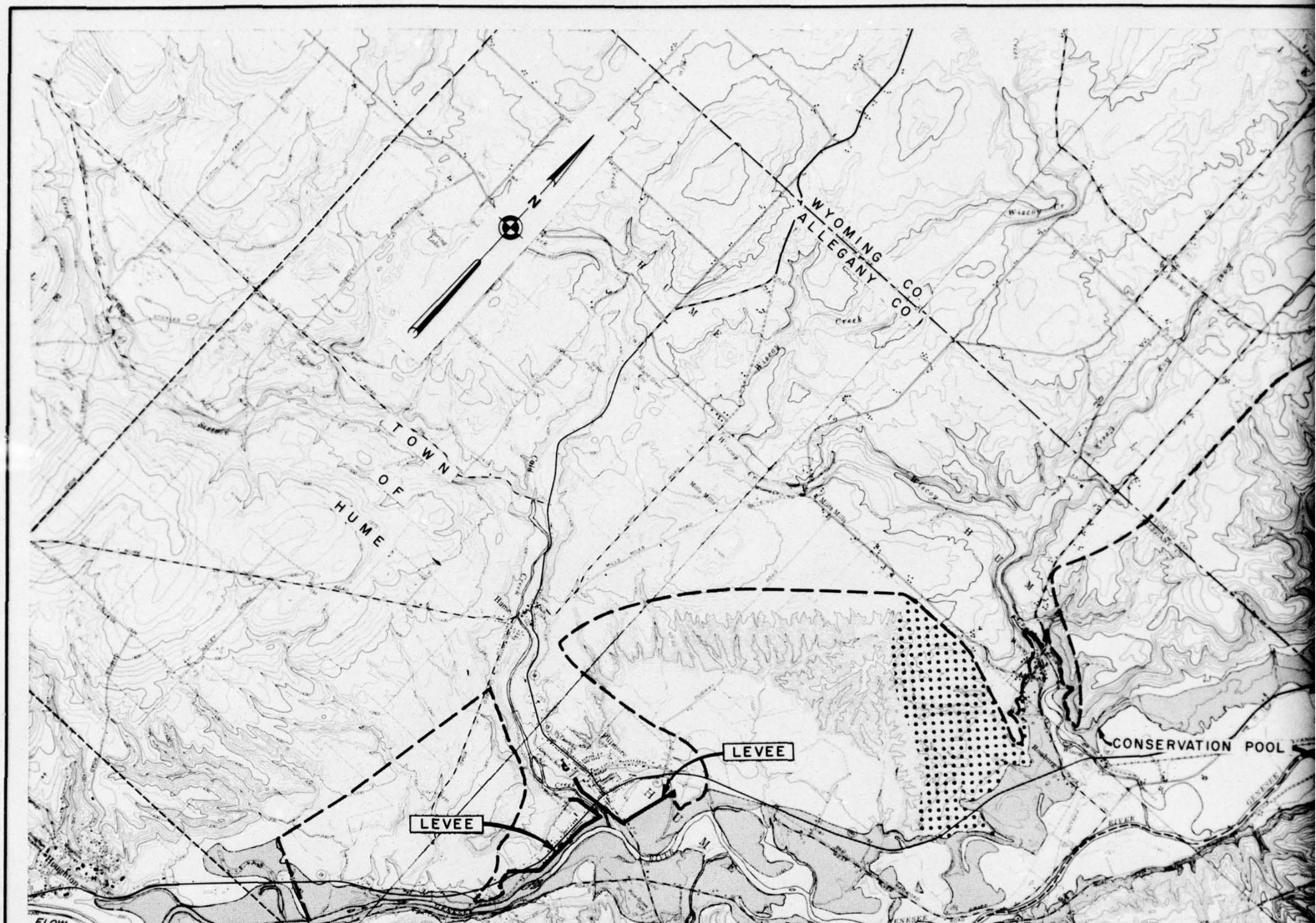
Various structural measures were investigated to alleviate flooding conditions at noted damage areas. These structural measures included both flood retarding reservoirs and channel improvement where appropriate. A total of 35 sites in the Genesee River Basin would give some degree of flood prevention benefits but are too costly to be justified for flood prevention alone.

29. Considerably greater opportunity for a flood control program exists in the Canaseraga Creek Watershed. Three separate systems of control were examined in this area. One system, consisting of a flood control channel alone would provide estimated average annual benefits from all sources of $215,920. The average annual cost of this channel is estimated to be $405,430. A second system consisting of a smaller channel and six upland flood water reaarding structures would provide the same level of protection at a cost of $399,370.

30. The benefit-cost ratio of the first system is 0.53 to 1.0 while the second system has a benefit-cost ratio of 0.54 to 1.0. A third system consisting of a channel and multiple purpose retarding structures on the flood plain has been proposed by the U. S. Army Corps of Engineers as a coordinated effort between the Soil Conservation Service, the U. S. Fish and Wildlife Service, and the Corps of Engineers. The plan is shown in the main report of the Genesee River Basin Comprehensive Study and details appear in Appendix C - Project Designs and Cost Estimates.

31. IRRIGATION

A total of five sites in three watershed areas appear feasible to provide water for irrigation in the Genesee River Basin. Two of these sites can be excluded since they duplicate areas irrigated from the other sites. The beneficial storage provided by each site is proportional to the number of acres available to irrigate from that particular structure. Multi-purpose use of an irrigation reservoir is



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TOWN BOUNDARY

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

PROPOSED
PORTAGE RESERVOIR

CORPS OF ENGINEERS, BUFFALO DISTRICT

SEPTEMBER 1967

FIGURE B8

limited due to the wide fluctuation of the water level. This fluctuation is not conducive to such uses as recreation or fish and wildlife habitat. However, such sites could be constructed to provide additional storage for other water supply needs.

32. Only three watersheds were involved in the final determination of feasible irrigation structures in the Basin. In all of them, one site was sufficient to supply irrigation water to the majority of the irrigable acreage although alternative sites were available in each. Similarly, each site offered considerable low-cost extra storage beyond that necessary for irrigation. These watersheds which offer irrigation water storage present opportunities for development under the Watershed Protection and Flood Prevention Act, Public Law 566. If sponsored by local qualified groups as PL-566 projects, they will need to be evaluated on their individual merits. Design and cost features of these selected irrigation reservoirs are listed in Table B-48. The cost data includes the costs of distribution to individual farms.

33. FISH AND WILDLIFE

The projected needs of the fish and wildlife resource of the Basin are developed in Appendix N. These needs are shown in terms of projected annual use-days by decade. From the list of potential sites determined by Task Group 5, those sites feasible for fish and wildlife habitat were indicated for further study. These preliminary selections were designed, costs were estimated, and tentative benefits determined. Then, formulation of the plan was based upon the economic feasibility of the site and its potential for helping to meet the needs of the future. In combination with the structures proposed in the main report, the structures recommended here come very near to meeting the 1980 needs for cold water fishing in the Basin. However, proposed waterfowl habitat sites were generally found to be too expensive for justification. It is felt that much of this type of development can be carried out under current state programs which utilize different design criteria and may result in lower installation costs.

34. In total, 23 impoundment sites were included in the plan for fish and wildlife development. The general location of these sites is shown on Plate B-3, while relevant data on each site is given in Table B-49.

35. Of the listed sites, 6 will also serve a second primary purpose of recreation and one is an irrigation site which will also supply augmentation water to a trout stream. It should be noted that the majority of the sites in the Basin will provide fish and wildlife benefits incidental to some primary purpose. Because of the stable pool level, recreation sites will go furthest towards providing these

TABLE B-48. Reservoir sites to meet 1980 irrigation needs, Genesee River Basin, 1966

Site No.	Drainage area(sq.mi.)	Storage (Ac.Ft.)	Height of dam (ft.)	Installation cost		Ave.ann. cost 1/	Ave.ann. benefits	Benefit-cost ratio	Use
				Structure	Pump facilities				
11-2	11.7	3,820	42	$244,500	$70,200	$14,830	$40,260	2.71	Irrig. 2/
17-19	7.5	690	23	357,200	---	12,060	22,100	1.83	Irrig. 3/
17-21	2.4	320	14	320,700	---	10,220	10,240	1.00	Irrig.
19-4	0.6	102	13	45,600	---	2,150	3,270	1.52	Irrig. 3/
19-7	6.5	570	30	360,000	---	20,700	18,250	0.88	Irrig.

1/ This cost will include operation and maintenance costs.

2/ At this level of construction, additional water will be supplied for augmentation of the stream for fish and wildlife habitat improvement and possibly public water supply for Warsaw.

3/ Sites 17-19 and 17-21 are mutually exclusive as are sites 19-4 and 19-7.

Table B-49. Reservoir sites to meet 1980 fish and wildlife needs, Genesee River Basin, 1966

Site No.	Drainage area (Sq.Mi.)	Surface acres	Height of Dam (Ft.)	Installation cost: Structure ($1000)	Installation cost: Facilities ($1000)	Aver. ann. cost	Aver.ann. benefits 1/	Benefit-cost ratio	Other uses 2/
3-1	23.7	216	102	1,983	2	67,200	114,000	1.7	-
3-4	10.4	156	65	1,886	251	107,500	139,900	1.3	Rec
5-21	1.6	86	59	357	2	12,300	45,000	3.7	-
7-1	17.6	127	65	651	2	22,200	59,800	2.7	-
7-2	15.7	1715	50	1,503	412	122,700	855,000	7.0	Rec
8-13	2.8	227	39	322	144	36,100	162,000	4.5	Rec
9-3	6.7	72	77	833	2	28,300	31,000	1.1	-
10-3	2.7	122	39	245	2	8,500	64,000	7.6	-
11-2	11.7	-	33	245	70	10,600	40,260	3.8	I
11-4	1.8	92	53	477	2	16,300	48,000	3.0	-
13-1	5.0	60	119	758	2	25,800	32,000	1.2	-
13-6	16.3	243	47	833	250	71,900	172,900	2.4	Rec
13-22	19.1	94	85	1,005	2	34,100	50,000	1.5	-
13-24	1.8	31	88	652	2	22,200	26,000	1.2	-
14-4	1.1	90	79	417	2	14,200	47,000	3.3	-
14-5	2.2	90	89	496	2	16,800	47,000	2.8	-
15-2	10.0	720	31	617	185	53,300	58,400	1.1	Rec
17-1	2.7	202	48	981	2	33,400	107,000	3.2	-
17-7	12.6	124	142	1,260	2	42,400	65,000	1.5	FP
17-8	2.1	215	66	492	2	16,700	90,000	5.4	-
17-12	17.0	500	46	686	16	28,200	161,000	5.7	WQ
17-24	3.1	258	44	367	247	55,600	181,000	3.3	Rec
19-7	6.5	155	31	448	2	23,700	60,000	2.5	I

1/ This column contains preliminary Fish and Wildlife benefits plus benefits from other sources.

2/ Rec - recreation; I - irrigation; FP - minor flood prevention possibilities; WQ - water quality.

benefits, but they will also accrue in some measure to nearly all of the other sites. Also noted here is the contribution of these type of structures to rural development. While not strictly part of the agricultural resource, these developments provide large increases in rural wealth through increases in commercial activity, greater opportunity for the rural labor force, increased value of farms and rural property and in recreational opportunity for rural residences.

36. RECREATION

Sites recommended for recreation development and use are those recommended in Appendix M, Recreation. The formulation procedure followed was quite similar to that followed for selection of Fish and Wildlife sites, in that all sites were screened for physical and economic feasibility first and then chosen on their ability to meet a total projected recreation need.

37. Factors affecting the structural selection include the availability of access, fluctuation and size of water surface, characteristics of surrounding terrain and vegetation, dependability of water yield, geologic conditions and the presence of alternative or complementary uses.

38. The costs shown in Table B-50 reflect additional land acquisition and road construction considered necessary to derive the given level of benefits for recreational development. It should be noted that the costs of facilities were not determined from an individual plan for each site, but are derived from typical costs necessary to service the projected recreation users of each site.

39. Site 1-5 would include some significant flood control benefits as a second increment. Six other sites will include fish and wildlife benefits as an additional primary purpose and the remainder of the sites will offer at least incidental fish and wildlife benefits.

40. WATER QUALITY MANAGEMENT

A description of the low flow needs of the Genesee River Basin is given in Appendix H. From these projected needs and the preliminary site inventory, it was possible to locate those sites which had a yield great enough to supply the supplemental water. The economic feasibility of these sites was determined by estimating the annual alternative cost of advance treatment and comparing this with the annual cost of constructing, maintaining and operating the potential site. Where the annual cost of augmentation was less than the alternative cost of treatment, the site was determined to be feasible.

Table B-50. Reservoir sites to meet 1980 recreation needs, Genesee River Basin, 1966. 1/

Site No.	Drainage area (Sq.Mi.)	Surface acres	Height of dam (Ft.)	Installation Cost: Structure ($1000)	Installation Cost: Facilities ($1000)	Aver.ann. cost	Annual benefits 2/	Benefit-cost Ratio	Other uses 4/
1-5	19.5	110	102	1,469	213	82,670	65,700	0.79 3/	FP
3-4	10.4	156	65	1,886	251	107,460	139,900	1.30	FW
5-1	19.6	138	87	802	77	40,580	22,500	0.55 3/	
7-2	15.7	1,715	50	1,503	412	122,740	855,000	6.97	FW
8-13	2.8	227	39	322	144	36,070	162,000	4.49	FW
10-2	0.9	52	36	191	69	18,470	20,000	1.08	
10-14	1.0	40	35	146	77	18,430	22,500	1.22	
13-6	16.3	243	47	833	250	71,860	172,900	2.41	FW
15-2	10.0	720	31	617	185	53,230	58,400	1.10	FW
16-2	6.6	180	20	267	125	30,930	36,500	1.18	
17-24	3.1	258	44	367	247	55,590	181,000	3.26	FW
19-11	3.3	315	18	443	2,318	419,960	675,000	1.61	
20-2	1.3	140	18	418	1,545	284,110	450,000	1.58	

1/ As recommended by Task Group 8, Recreation Studies. cf. Genesee River Basin Comprehensive Study of Outdoor Recreation, Dept. of Interior, Bureau of Outdoor Recreation, June 1967.

2/ Benefits are based primarily upon Recreation Use except for sites 7-2 and 8-13, which derive a significant portion of their benefits from Fish and Wildlife use. No secondary, indirect, or redevelopment benefits have been assigned to any of the sites.

3/ This site was recommended without consideration for its benefit-cost ratio. It is expected that a detailed evaluation of all benefits accruing to the site and a reevaluation of recreation facility costs may result in a favorable benefit-cost ratio.

4/ FP - Flood Prevention; FW - Fish and Wildlife.

41. Three small watershed impoundment structures were determined to be in the range of justification and may be considered as alternatives to advance treatment systems in formulation of the Basin program. They provide supplemental water for Mill Creek below Wayland, Wilkins Creek below Livonia and Oatka Creek below Warsaw. In addition, a site which augments Honeoye Creek below Honeoye Falls comes very close to justification and is included because of the potential additional benefits due to fish and wildlife habitat enhancement, incidental recreation benefits and other possible benefits. The data and costs of these sites are given in Table B-51 and their general location is shown in Plate B-3.

42. WATER SUPPLY

Task Group 4 determined projected water supply needs by municipal and industrial water users in the Genesee River Basin. An inventory of sites potentially capable of supplying this water was then made. Eleven sites were tentatively selected in this process. In a subsequent screening based upon costs, ground water availability, and local interest, this list was reduced to one site, 18-7. This structure would supply water for the village of Warsaw which has expressed its need for and interest in the site. The location of this site is shown on Plate B-3 while data and costs are shown in Table B-52.

43. It should be recognized that no provision has been made for the inclusion of the cost of special gated release, distribution pipeline, or other such expense. The cost presented is for construction only. Any changes in structureal dimension, materials, or design criteria will necessitate a revision in estimated structure cost.

44. SUMMARY

The upstream impoundment program as presented here is an assessment of projected needs and possible solutions. The implementation of any such program will generally require strong local support or an effective state or county-wide development plan. It is anticipated that much of the impetus for this development will come from the growing awareness by an educated public of the opportunities for needed water resource development. As evidence of this awareness, requests have been received from both public and private organizations on several of the recreation structures in the southern part of the Basin. A county in the northern portion of the Basin has incorporated two of the proposed recreation structures in its master plan for recreation. A village has requested further information on a water supply structure and farmers are discussing their participation in an irrigation structure.

Table B-51 Reservoir sites to meet 1980 water quality control needs, Genesee River Basin, 1966

Site No.	Drainage area (sq.mi.)	Beneficial storage (Ac.Ft.)	Average release provided (CFS)	COSTS: Installation ($1000)	COSTS: Per A-Ft. beneficial storage (Dollars)	COSTS: Per contin. CFS provided ($1000)	COSTS: Average annual cost (Dollars)	Benefits 1/ (Dollars)	Benefit-cost ratio	Problem area
13-27	0.8	230	0.23	273	1187	1187	9,220	13,500	1.46	Mill Cr. below Wayland
16-7	0.7	328	0.35	157	479	449	5,300	10,000	1.89	Wilkins Cr. below Livonia
17-12	17.0	6660	3.70	686 2/	105	185	23,160	19,800	0.85 3/	Honeoye Cr. below Honeoye Falls
18-2	2.4	1488	1.30	308	207	237	10,400	37,500	3.61	Oatka Cr. below Warsaw

1/ Limited to minimum alternative cost of advance treatment facilities.

2/ Does not include disposition of gas wells or pipelines in pool area.

3/ Evaluation of additional benefits in detailed planning stage could perhaps justify this site.

Table B-52 Reservoir sites to meet 1980 municipal and industrial water supply needs 1/, Genesee River Basin, 1966

Site No.	Drainage area (Sq.Mi.)	Beneficial storage (A-ft.)	Surface area bene. pool (Acres)	COSTS 2/: Total installation ($1000)	COSTS 2/: Total inst. per A-ft. (Dollars)	COSTS 2/: Total av. annual (Dollars)	COSTS 2/: Per A-ft. av. ann. (Dollars)
18-7	2.9	700	45	484	690	16,300	23.60

1/ Excluding Monroe County.

2/ Costs are for structure only and do not include costs of delivery.

45. In addition to this interest, the State of New York has already entered into a program to participate in cost-sharing of lands needed for fish, wildlife and recreation developments. It is also assumed that the Bureau of Outdoor Recreation could facilitate developments such as the Birdsall site 7-2 through its Land and Water Conservation Fund.

46. Due to legislative restrictions, the program proposed here could not be implemented entirely under Public Law 566. Only those watersheds which include flood control or agricultural water management as primary purposes are eligible for construction with federal cost sharing. Only three of the 20 Basin watersheds fall in this category, Watersheds 11, 17 and 19. All of the potential irrigation structures in the Ontario Lake Plains Service Area can be constructed under the current program.

47. Within these three eligible watersheds, there are also single purpose recreation and fish and wildlife structures which could not be included in a plan for construction. Because of these ineligible features, only five of the 35 potential Basin structures could become part of any PL-566 plans. The remaining structures will require Basin-wide authorization if 1980 water resource needs are to be met.

CANASERAGA PROJECT

48. GENERAL

Canaseraga Creek is the largest tributary of the Genesee River with a drainage area of 335 square miles at the mouth. It is located in the Lower Genesee Basin and joins the Genesee River about 4 miles downstream of Mount Morris Dam. Streams tributary to Canaseraga Creek include Mill, Sugar and Slader Creeks and Stony Brook in the upper reaches of the basin and Keshequa and Bradner Creeks in the lower reaches. Keshequa Creek, with a drainage area of 76 square miles, is the largest stream tributary to Canaseraga Creek. The Canaseraga Basin, designated Subwatershed 13 for this comprehensive study, is shown on figure B4.

49. The Canaseraga Creek Basin approximates a square of about 20 miles on a side. The upper reaches of the basin are steep and rugged with a main stem slope of about 40 feet per mile. The lower valley, from Dansville downstream to the confluence with the Genesee River, is a flat alluvial plain with a main stem slope of about 3 feet per mile. The creek, rising at about elevation 1900, joins the Genesee River at river mile 63 at about elevation 548.

50. The area studied, a broad, flat plain known as the Canaseraga Valley, extends from Woodsville, New York downstream to the Genesee River. The valley is about 15 miles in length and varies from one to three miles in width. Canaseraga Creek meanders through the valley in a generally northwesterly direction. Keshequa and Bradner Creeks are two tributaries of Canaseraga Creek whose confluences are in the Canaseraga Valley.

51. The Canaseraga Valley, a rich agricultural area, is inundated to some extent annually by streamflow exceeding the channel capacity in the upper reaches of the valley and poor local drainage in the lower reaches. This poorly drained area provides habitat where thousands of waterfowl stop during their spring migration. Flood damages in the valley are agricultural consisting of crop and pastureland losses as well as other on farm losses such as fences and roads. The drainage problem in the lower reaches of the valley is the result of very flat gradients, the top of creek banks generally being higher in elevation than the surrounding farm lands, and limited waterway openings under road and railroad embankments of considerable height that traverse the valley. These conditions cause ponding from State Route 408 at Shakers Crossing upstream to West Sparta. The outline of the ponding area for the April 1961 flood, a 5-year event on an annual basis, is shown on Plates F-14 and F-15 of Appendix F. Inundation of this area has been

known to last for several months, as was the case after the 1961 flood. Ponding caused by spring floods prevents early planting thereby limiting the type of crops that can be grown because of the shorter growing season. Ponding as a result of summer flooding causes extensive damage because truck garden crops that have been planted are destroyed when inundated for an extended period.

52. Overland flooding, due to limited channel capacity, occurs in the upper reaches of the valley. Overbank flow on Canaseraga Creek occurs just downstream of Cumminsville at a flow of about 3000 cfs. The Dansville and Mount Morris Railroad embankment prevents the overbank flow from re-entering Canaseraga Creek further downstream and the high banks along Bradner Creek prevent the overbank flow from entering Bradner Creek. The result is flooding over the area west of the Dansville and Mount Morris Railroad for Canaseraga Creek discharges in excess of 3000 cfs. This is about a 1-year event on an annual basis and a 3-year event on a summer basis.

53. The Mount Morris flood control reservoir, a Federal project that went into operation in November 1951, has significantly reduced flooding in the lower reaches of the Canaseraga Valley from its confluence with the Genesee River upstream to Keshequa Creek. Prior to this project, high tailwater conditions on the Genesee River caused backup into the Canaseraga Valley and resulted in inundation of a portion of the lower valley.

54. The Canaseraga Project is described in survey scope detail in Part IV, Appendix C, Project Designs and Cost Estimates.

55. SOLUTIONS CONSIDERED

The flood problem in the area studied is agricultural in nature. Due to the drainage problem in the study area, any improvement contemplated must consider channel improvement in the study area to control local flows.

56. Reservoir control of flood waters originating in the Canaseraga Creek watershed was considered. Sites at Poag's Hole in Canaseraga Creek upstream of Dansville and downstream of Tuscarora, New York on Keshequa Creek were investigated. These sites could not provide the required protection when considered separately because of the small drainage area controlled by each. When considered jointly, the channel improvement would still be required in the study area of the Canaseraga Valley to obtain the desired protection. In any event, reservoir control was not considered justifiable for protection of the Canaseraga Valley flood area. Further discussion of the reservoir

sites can be found in Section III, Appendix "C," Project Designs and Cost Estimates. The total investment cost is estimated for Poag's Hole reservoir at $32,100,000 and for Tuscarora reservoir at $17,000,000. Thus the total investment cost for the combined reservoirs would be $49,100,000 plus some cost for channel improvement.

57. Stream diversion, or similar types of remedial measures, was not considered feasible so was not given consideration during this study. Consequently, the study was concentrated on provision of protection in the immediate problem area utilizing channel improvement by straightening and enlargement, construction of levees and enlargement of waterway openings through bridges.

58. PROJECT PURPOSES

The proposed plan of improvement would provide for multi-purpose benefits from flood control and recreation. The flood control benefits would be agricultural consisting of benefits due to reduction of flood damages and changed land use and intensified land use benefits. The recreational benefits would be realized from fish and wildlife usage and would result from provision of ponding areas in the study area to be used as nesting and rearing grounds for waterfowl during the summer season and resting and feeding grounds during the fall migration. Additional recreational benefits would result from increased bird-watching opportunity and increased waterfowl hunting opportunity.

59. PLAN OF IMPROVEMENT

The plan of improvement was designed to:

a. Protect the Canaseraga Valley from Shakers Crossing upstream to White Bridge from flooding from the 5-year discharge on the "summer event" basis;

b. Sufficiently reduce the duration of flooding in the existing ponding area upstream of Keshequa Creek to assure the farmers use of this land by a certain date a certain percentage of the years; and

c. Provide a control at the lower end of the improvement to limit the discharge from the valley to that discharge that would have occurred under existing conditions and thereby produce no greater damage on the lower Genesee Basin due to discharge from Canaseraga Creek than would have occurred under existing conditions. The improvement was designed on the "summer events" basis since the major portion of the flood damages is the result of summer flooding and the related agricultural benefits from changed land use and more intensive land use results from acreage of crop land that would be protected against summer flooding.

60. DESIGN DETAILS

Details for the various structures incorporated in the plan of improvement are as follows:

a. Retention structure. The retention structure is approximately 12,600 feet in length and consists of:

(1). A gated concrete spillway and stilling basin, with separate gated outlet works, founded upon steel monotube piles.

(2). A 9000 ft. earth embankment non-overflow section, of 18 feet top width and 1 vertical on 2-1/2 horizontal side slopes, seeded and provided with a 12-ft. wide gravel roadway across the top for access and maintenance purposes.

(3). A 3500 ft. earth overflow section, of 18 feet top width and 1 vertical on 2-1/2 horizontal side slopes, seeded on the upstream slope, and riprapped across the top width and downstream slope. The riprap is a 3 ft. thickness of stone with a 2 ft. filter thickness.

b. Fish and wildlife ponds. The ponds are enclosed with an earth embankment, of ten feet top width, and 1 vertical on 2-1/2 horizontal side slopes, seeded. A small pumping station and gated conduits are incorporated into the embankment.

c. Control structures and weirs. The structures consist of Z-27 steel sheet piling driven across the channel bottom and into the side slopes. The upstream part is riprapped with an 18-inch thickness of stone upon a 6-inch filter bed. The downstream end is riprapped with a 2-ft. thickness of derrick stone.

d. New bridge. The two highway bridges are designed for a H-20 highway loading. The 22-ft. wide bridge deck is of steel grating supported on a steel beam superstructure erected on steel monotube pile bents. The three farm bridges are of similar design except the roadway width is reduced to 12 feet and the design loading is H-15.

61. METHOD OF OPERATION OF RETENTION STRUCTURE

The operation of the proposed retention structure would be a Federal responsibility. It would be operated in conjunction with Mount Morris Dam on the Genesee River. Stages in the retention reservoir would be telemetered to Mount Morris Dam and the spillway tainter gates operated from Mount Morris accordingly. The permanent fish and wildlife ponds within the proposed retention reservoir would be regulated by non-Federal interests. During the spring runoff period, the

runoff from the Canaseraga Creek Basin would be stored in the retention reservoir while discharging the maximum non-damaging flows from Mount Morris Dam. This method would result in providing the maximum available storage in the Mount Morris reservoir to provide control of future high runoff from the Upper Genesee Basin while using the stored volume in the retention reservoir on Canaseraga Creek to fill the Fish and Wildlife ponds upstream of the retention structure. In the event additional high flows to the retention reservoir on Canaseraga Creek would present the possibility of overtopping the 3500 foot overflow section and thereby losing control of the discharge from the retention reservoir, flow from Mount Morris Dam would be reduced to the required minimum of 300 cfs. in order that high non-damaging discharges could be released from the retention reservoir utilizing the spillway tainter gates. If the local flows in the Lower Genesee River Basin were high at this time, the discharge from the retention reservoir would be limited to flow that would have occurred under natural conditions. During summer storms, the outflow from Mount Morris Dam would be limited to the required minimum for a sufficient period of time to permit maximum non-damaging discharge from the retention structure on Canaseraga Creek. This would provide for minimum damage to the croplands in the Canaseraga Valley.

62. LAND REQUIREMENTS

Lands for the retention structure embankment, levee embankment, channel improvement and the two permanent wildlife ponds would be required. Approximately 1400 acres of land would be required, 1140 acres of which would be required for the wildlife ponds.

63. GENERAL BENEFITS

Benefits would be realized from several sources for the multipurpose project proposed for the Canaseraga Valley. The estimated flood control benefits attributable to the project were provided by the Soil Conservation Service. The estimated fish and wildlife recreational benefits were provided by the U.S. Department of Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife.

64. Flood control benefits would result from the reduction of flood damages to agricultural lands by the lowering of Canaseraga Creek and tributary stages in the lower reaches of the Canaseraga Valley and protection by a levee in the upper reaches. Additional flood control benefits would be derived from changed land use and more intensive land use. The changed land use benefits would result from growing high value crops on land that is presently being used to grow lower valued crops because of the existing flood problem. The changed land use benefits are based upon the difference between the net annual

incomes derived from present crops and that derived from crops which farmers indicate they would grow if assured that flooding would be limited in frequency. Where land is potentially productive, as in the Canaseraga Valley, these benefits are substantial. Closely allied to changed land use benefits are more intensive land use benefits. These benefits are derived from shifting the land to a more intensified cropping system within the same general use plan. For example, additional inputs of capital in the form of fertilizers or land treatment might be justified on the unflooded land, causing increases in yield and profitability. The benefits are again equal to the increased net income due to the more intensive use.

65. Fish and wildlife benefits would result from provision of ponding areas to be used as resting and feeding areas for migratory waterfowl during the spring and fall migration and as nesting and rearing areas for continental waterfowl during the summer. Additional benefits that would be realized from the improvement are the recreational benefits from increased birdwatching opportunity and increased waterfowl hunting opportunity. An analysis of the increase in hunter demand in the Genesee Basin indicates that the number of hunter-days for all types of hunting can be expected to increase more than threefold by the year 1990. Provided with the proposed permanent ponds, the number of waterfowl hunter-days attributable to the project can be expected to increase at least at the same rate. The project could be expected to provide at least the same increase in birdwatching opportunity.

66. ESTIMATED TOTAL FLOOD CONTROL BENEFITS

The estimated total average annual benefits for the reduction of flood losses, changed land use benefits and more intensive land use benefits are shown in table B-53 for the eight damage reaches of the Canaseraga Valley.

TABLE B-53. - Estimated total average annual benefits at long term adjusted normalized price levels.

Reach	Average annual benefits: Reduction of flood losses	Changed land use	More intensive land use	Totals
1	$ 16,120	$ 4,750	$ 25,210	$ 46,080
2	3,370	4,210	19,230	26,810
3	1,530	760	4,020	6,310
4	10,180	4,390	14,210	28,780
5	320	1,540	3,330	5,190
6	9,620	5,160	16,720	31,500
7	4,430	4,840	8,910	18,180
8	9,320	7,990	14,710	32,020
Total	$ 54,890	$ 33,640	$ 106,340	$ 194,870

67. FISH AND WILDLIFE HABITAT BENEFITS

The information presented was provided by the Fish and Wildlife Service of the U. S. Department of Interior in a Planning Aid Letter dated 15 June 1967 to be used for project planning purposes only and not to be used in lieu of an approved report.

68. Moderate fishery values in the lower reaches of the Canaseraga Valley are greatly outweighed by the waterfowl values that would be realized from the project. Therefore, it was considered that the latter should be conserved and developed even at the expense of some losses to the fisheries. Although, those meanders and coves in the lower Canaseraga resulting from straightening should be preserved for fisheries and not used as areas for fill.

69. The poorly drained area from near State Route 408 upstream to Groveland, known locally as the Groveland Flats, has throughout the years provided habitat where thousands of migrating waterfowl have found a place to rest and feed. Primarily, this has been a stopping point on spring migration, due to the presence of ponding waters at that time. A relatively small amount of nesting has occurred; this has been limited, as has fall migration use, by the lack of ponded

waters in the summer and fall. Assuming that conditions continue to be about what they have been in the past, future use of the area is likely to remain at about the present level.

70. The average daily numbers of ducks and geese which presently use the area differ during periods of the year. In order to be able to draw comparisons with conditions which would exist with the project, this use has been related, insofar as possible, to the contemplated future pools.

71. The benefits presented are for conditions with the proposed improvement assuming that a Temporary Pond III would not be drained until 15 May each year, at which time most of the birds will have departed from the area and the few remaining could move over to one of the two permanent ponds. If Temporary Pond III were to be drained by 15 April, it was estimated that the ultimate waterfowl habitat value indicated would be cut in half.

72. Table B-54 presents the annual dollar value for habitat under ultimate conditions which would be realized about 20 years after completion of the project. The dollar values shown were determined by applying the minimum value of 12.4 cents per waterfowl-use day to the number of use-days.

73. During spring migration, the presence of thousands of waterfowl attracts people from as far away as Buffalo and Rochester. A survey by the New York State Division of Fish and Game in 1964 determined that at least 15,000 bird-watching days were enjoyed because of the birds at Groveland Flats that year. It is considered that this probably will be about the level of this type of use in the future without the project. Table B-55 presents the annual dollar value for bird-watching and waterfowl hunting with and without the project.

TABLE B-54 - Ultimate annual waterfowl use days and estimated habitat value in dollars (2)

Location	Spring Migration		Nesting & Rearing		Late Summer Use		Fall Migration		Total Use & Value	
	Waterfowl Days	Dollar Value (1)	Waterfowl Days	Dollar Value (1)	Waterfowl Days	Dollar Value (1)	Waterfowl Days	Dollar Value (1)	Waterfowl Days	Dollar Value
Pool I	313,000	$ 38,800	99,000	$12,300	12,600	$1,600	660,000	$ 81,800	1,084,600	$134,500
Pool II	180,000	22,300	50,100	6,200	6,300	800	480,000	59,500	716,400	88,800
Pool III	853,000	105,800	52,100	6,500	900	100	90,000	11,200	996,000	123,600
Total	1,346,000	$166,900	201,200	$25,000	19,800	$2,500	1,230,000	$152,500	2,797,000	$346,900

(1) All dollar values rounded to nearest $100.
(2) Ultimate use is expected to develop within 20 years after completion of the project.

TABLE B-55. - Summary of estimated annual birdwatching and waterfowl hunting values

Condition	Bird-watching Use days	Bird-watching Dollar (1) value	Waterfowl hunting Use days	Waterfowl hunting Dollar (2) value	Total $ value Birdwatching & hunting
With the project	45,000	$ 22,500	7,500	$ 30,000	$ 52,500 (3)
Without the project	15,000	7,500	2,500	10,000	17,500

(1) Estimated at $0.50 per use day.
(2) Estimated at $4.00 per use day.
(3) Annual dollar value 20 years after completion of project = $52,500. It is expected that about 56, 84 and 96 percent of the 20-year value will have developed within 5, 10 and 15 years respectively, after completion of the project.

74. ESTIMATED TOTAL FISH AND WILDLIFE RECREATIONAL BENEFITS

The estimated total equivalent average annual fish and wildlife benefits attributable to waterfowl habitat and birdwatching and waterfowl hunting are shown in table B-56.

TABLE B-56. - Estimated total equivalent average annual fish and wildlife benefits

Average annual habitat benefits	$ 171,220
Average annual bird-watching and waterfowl hunting benefits	26,680
Total fish and wildlife benefits	$ 197,900

75. DISCUSSION

Comparison of the estimated total average annual flood control benefits of $194,870 shown in table B-53 with the estimated total average annual fish and wildlife recreational benefits of $197,900 shown in table B-56 shows that slightly more than 50 percent of the total project benefits would be provided by the fish and wildlife interests. Normally, a project could not be recommended if the general recreational benefits provide for 1/2 of the total project benefits. However, a large portion of the total fish and wildlife benefits would result from enhancement to migratory waterfowl. On the basis that the preservation and enhancement of migratory waterfowl would be of national significance, it was considered that this portion of the fish and wildlife benefits would not be classified as general recreational benefits and therefore should not be included when comparing the estimated total average annual fish and wildlife benefits to the total project benefits. Using this criterion, it was determined that the remaining general recreational benefits would provide for considerably less than 50 percent of the total project benefits. Since the total fish and wildlife benefits over flood control benefits would only be $3,030 ($197,900 - $194,870) it was considered that it would not be necessary to separate the benefits attributable to the migratory interests from the total fish and wildlife benefits.

76. PROJECT FORMULATION

A design discharge of 7,300 cfs. at Shakers Crossing was used to design the channels for the recommended plan of improvement. It has a frequency of recurrence of 5 years on the "summer events" basis. Allocation of costs for the improvement was made on the basis of benefits expected from flood control and fish and wildlife. The proposed dual-purpose project would have a benefit-cost ratio based on allocated costs of 1.2 to 1. A plan of improvement providing 10-year flood protection would result in a substantial increase in first costs and a minimal increase in flood control benefits indicating that further increments in the degree of flood protection would further decrease the above ratio. The fish and wildlife benefits, on which the above benefit-cost ratio is based, assumes that Temporary Pond III would not be drained prior to 15 May of each year. Earlier draining of this pond would decrease the above benefit-cost ratio.

77. **ALLOCATION OF COSTS**

Initial studies on Canaseraga Creek were directed toward development of plans to alleviate the flood problem. The flood control plan developed for protection of the Canaseraga Valley requires a retention structure to control the outflow from Canaseraga Creek into the Genesee River. This feature would be common to a fish and wildlife improvement by providing a controlled ponding area to be used by waterfowl. No changes in the plan of improvement for flood control would be required. However, certain features would be added to the improvement to obtain the recreational benefits from fish and wildlife. Sizable benefits would be realized from the use of the improvement by fish and wildlife interests. Studies were made to determine the amount of benefits that would result if the fish and wildlife use was developed with flood control in a dual-purpose project, and to determine the appropriate related allocation of project costs between the purposes.

78. Costs of the dual-purpose project were allocated first to each purpose, and then apportioned between Federal and non-Federal interests.

79. **ESTIMATE OF COSTS AND BENEFITS FOR MULTIPLE-PURPOSE PROJECT**

Table B-57 following, summarizes the estimated first costs, annual maintenance costs and annual benefits for a multiple-purpose project.

TABLE B-57. - Estimate of costs and benefits for multiple-purpose project

Construction costs:	
Lands	$ 236,000
Relocations	310,500
Channels	2,886,000
Levee	40,500
Retention structure	2,410,000
Fish and wildlife facilities	633,000
Engineering and design	580,000
Supervision and administration	370,000
Total	$ 7,466,000
Annual operations and maintenance costs:	$ 23,700
Annual benefits:	
Flood control	$ 194,870
Fish and wildlife	197,900
Total	$ 392,770

80. For allocation, flood control and fish and wildlife were considered the purposes of the project. Costs for project facilities needed to fully develop these two purposes were allocated to these purposes on the basis of separable costs and remaining benefits. All computations to determine annual charges for allocation of the first costs assumed an interest rate of 3-1/8 percent and a 50-years life. For all features, a two-year construction period was assumed, and interest for one year was added to first costs to determine investment costs.

81. Estimates of costs were developed for alternate projects which would produce single-purpose benefits equal to those produced by the dual-purpose project. The total estimated first and annual costs for alternative single-purposes flood control and fish and wildlife projects are given in table B-58. In the allocation, made on the basis of annual costs, the amount allocable to each purpose was limited by these alternate annual charges or by the related benefits, whichever were smaller. The single-purpose flood control project would not be justified, so allocation of the dual-purpose project costs to that purpose was limited by the flood control benefits developed.

TABLE B-58. - Annual charges for alternative single purpose projects

Item	Flood control	Fish and wildlife
First cost	$ 6,520,000	$ 3,740,000
Interest during construction	203,800	116,900
Investment	6,723,800	3,856,900
Annual charges:		
Interest	$ 210,120	$ 120,530
Amortization	57,420	32,940
Operation and maintenance	21,650	8,550
Total	$ 289,190	$ 162,020

82. Separable first costs and annual costs for each purpose were obtained by subtracting the costs of the alternate single-purpose plan from the costs of the dual-purpose project. The estimated separable first costs and separable annual costs for each purpose are given in table B-59.

TABLE B-59. - Annual charges for separable project costs

	Dual-purpose project			
	Separable costs			
	Flood control	Fish and wildlife	Joint use costs	Total
ESTIMATED COSTS	$	$	$	$
Construction expenditures	3,726,000(1)	946,000(2)	2,794,000	7,466,000
Interest during construction	116,400	29,600	87,300	233,300
Investment	3,842,400	975,600	2,881,300	7,699,300
Annual charges:				
Interest	120,080	30,490	90,040	240,610
Amortization	32,810	8,330	24,610	65,750
Operation and maintenance	15,150	2,050	6,500	23,700
Total	168,040	40,870	121,150	330,060

(1) Estimated first costs for single purpose fish and wildlife project = $3,740,000.

(2) Estimated first costs for single purpose flood control project = $6,520,000.

83. Annual costs of operation and maintenance of the dual-purpose project were estimated and allocated by the same method as the annual construction charges. The separable annual maintenance costs were assigned directly to their respective purposes. The remaining (joint) annual maintenance costs were then allocated on the basis of the benefits remaining after total separable annual costs were subtracted.

84. The allocated maintenance costs were subtracted from the allocated total annual costs, and the total first costs allocated to each purpose in proportion to the remainder. The allocation computations as described above are shown in table B-60.

TABLE B-60. - Allocation of costs to purposes

	Flood control	Fish and wildlife	Dual purpose
ALLOCATION COMPUTATION			
	$	$	$
First costs, alternate projects	6,520,000	3,740,000	7,466,000
Annual charges including operations and maintenance, alternate projects	289,190	162,020	330,060
Annual maintenance, alternative projects	21,650	8,550	23,700
Total annual benefits	194,870	197,900	392,770
Allocation of annual charges dual-purpose project:			
1. Benefits	194,870	197,900	
2. Alternative costs	289,190	162,020	
3. Benefits limited by alternative costs	194,870	162,020	
4. Separable costs	168,040	40,870	208,910
5. Remaining benefits	26,830	121,150	147,980
6. % distribution of item 5	18.13	81.87	100.00
7. Allocated joint costs	21,960	99,190	121,150
8. Total allocation	190,000	140,060	330,060
Allocation of maintenance, dual-purpose projects:			
9. Separable costs	15,150	2,050	17,200
10. % joint costs, item 6	18.13	81.87	100.00
11. Allocated joint costs	1,180	5,320	6,500
12. Total allocation	16,330	7,370	23,700
Allocation of first costs, dual-purpose project:			
13. Allocated annual charges	190,000	140,060	330,060
14. Allocated maintenance	16,330	7,370	23,700
15. Remainder	173,670	132,690	306,360
16. % distribution of item 15	56.69	43.31	100.00
17. Allocated first costs	4,232,500	3,233,500	7,466,000

85. APPORTIONMENT OF COSTS TO INTERESTS

The estimated apportionment of costs to interests for the dual-purpose project was based on the following criteria:

a. Flood control. The non-Federal share of the flood control costs would include the costs of lands, easements and rights-of-way, necessary relocations (excluding removal of three farm bridges) and the annual maintenance cost allocated to flood control less $150 for Federal inspections. On this basis, the non-Federal flood control costs would be $27,000 for lands, $309,000 for relocations and annual maintenance charges amounting to $16,180. The remaining flood control costs would be Federal.

b. Fish and wildlife. The non-Federal share of the fish and wildlife costs would include one-half of the separable costs chargeable to fish and wildlife and the annual operations and maintenance cost allocated to fish and wildlife less $50 for Federal inspections. Therefore, the non-Federal share of the fish and wildlife first costs of $946,000 would include separable costs of $473,000, including 50 percent of the land costs, and annual operations and maintenance costs would be $7,320. The remaining costs would be Federal.

86. Based on the allocation in table B-61, non-Federal interests would be allocated $809,000 of the $7,466,000 first costs for the development of the two project purposes. Of this amount, $440,000 represents costs of lands and relocations. The balance of the non-Federal responsibility, $369,000 may be met by a cash contribution toward Federal construction costs, construction of equivalent work or any suitable combination thereof.

87. The total estimated cost for operation and maintenance of the multiple-purpose project would be $23,700. In accordance with the allocation to project purposes, responsibility for maintenance costs would be divided between Federal and non-Federal interests as follows:

TABLE B-61. - Allocation of operations and maintenance costs

Item	Federal	Non-Federal(1)	Total
	$	$	$
Flood control	150	16,180	16,330
Fish and wildlife	50	7,320	7,370
Total	200	23,500	23,700

(1) Includes $2,500 for providing for operation of the retention structure which may be accomplished by federal interests.

88. The final breakdown of the first and annual costs for the two purposes of the dual-purpose project, the applicable benefits, and the benefit-cost ratio for each purpose and for the dual-purpose project, is shown in table B-62. All computations to determine annual charges assumed a Federal interest rate of 3-1/8 percent, a non-Federal interest rate of 3-1/8 percent and a 50-year project life. A two-year construction period was assumed for all features, and interest for one year was added to the first costs to determine the investment costs.

TABLE B-62. - Summarized allocation

Item	Flood control	Fish and wildlife	Total
	$	$	$
Allocated first costs			
Federal	3,896,500	2,760,500	6,657,000
Non-Federal	336,000	473,000	809,000
	4,232,500	3,233,500	7,466,000
Investment costs			
Federal	4,018,200	2,846,800	6,865,000
Non-Federal	346,500	487,800	834,300
	4,364,700	3,334,600	7,699,300
Annual Costs			
Interest & amortization			
Federal	159,890	113,280	273,170
Non-Federal	13,780	19,410	33,190
Maintenance	16,330	7,370	23,700
	190,000	140,060	330,060
Annual benefits	194,870	197,900	392,770
Benefit-cost ratio	1.03	1.4	1.2

CONCLUSION

89. A dual-purpose plan of improvement on Canaseraga Creek in the Canaseraga Valley from the mouth upstream to near Woodsville would be economically justifiable. The plan would consist of enlargement and straightening of approximately 20 miles of channels, provision of a retention structure with appurtenances near the downstream end of the study area and provision of fish and wildlife ponds upstream of the retention structure. This plan provides a feasible solution to the flood problem in the Canaseraga Valley and would produce sizable additional benefits attributable to fish and wildlife interests. Annual costs are estimated at $330,060 and annual benefits at $392,770. The ratio of benefits to cost would be 1.2 to 1.

OTHER WATERSHED DEVELOPMENT NEEDS

90. LAND TREATMENT

A summary of the total needed land treatment measures is given in Section 11, paragraph 24 and the estimated cost of that treatment is given in table B-63. The costs are based upon weighted average costs of the typical treatment measures needed to correct the deficiencies.

Table B-63. Needs and cost summary for conservation treatment

Land use	Total program		Program to 1980	
	Acres needing treatment	Estimated cost	Acres to be treated	Estimated cost
Cropland	312,000	$20,053,000	111,000	$7,126,000
Pasture	154,000	10,117,000	42,000	2,755,000
Forest land	271,000	11,000,000	74,500	3,030,000
Total	737,000	41,170,000	227,500	12,911,000

A more detailed description of the total program required by problems and solutions follows in table B-64.

Table B-64. Total conservation program description

Land use	Problem	Acres needing treatment	Program description
Cropland			
	Erosion	218,000	Contouring, strip cropping, diversions and grassed waterways
	Excess water	90,000	Tile drains, open ditches
	Unfavorable Soil	4,000	Conversion to pasture or woodland
		312,000	
Pasture			
	Poor cover	120,000	Improve by planting, mowing and fertilizing
	Erosion & excess water	27,000	Tile drains, open ditches and diversions
	Overgrazing	7,000	Better land management
		154,000	
Forest			
	Poor cover	96,500	Planting, exclude cattle
	Grazing	27,000	Fencing
	Hydrologic	145,000	Thinning, weeding and sanitation cutting
	Erosion	2,700	Draining and stabilizing old logging roads, trails; reinforcement planting
		271,000	

91. Table B-65 shows the present level of accomplishments under current programs and also presents a program to meet 1980 needs. The cost of this program is estimated at $985,000 for technical assistance and $2,045,000 for installation costs; a total of $3,030,000.

Table B-65. Current and recommended program for forest land treatment measures Genesee River Basin, 1966

Practice	Annual accomplishments under current programs	Recommended total program to 1980	Acceleration above current programs
Management plan	60 plans	1,650 plans	870 plans
Tree planting	1,800 acres	35,500 acres	12,100 acres
Hydrologic stand improvement	1,100 acres	23,000 acres	8,700 acres
Woodland grazing control (fencing)	500 acres 2 miles	15,000 acres 60 miles	8,500 acres 34 miles
Erosion control - skid trail and logging road	40 acres 1 mile	1,000 acres 25 miles	480 acres 12 miles

The program will reduce erosion and sediment production, thereby improving water quality. It will also improve the hydrologic condition of the treated areas, increasing the ability of those areas to infiltrate and detain storm runoff.

92. In general, present levels of fire protection are adequate but they should be continued in the future.

93. BLACK CREEK, GENESEE RIVER CONFLUENCE

This area has experienced a steadily increasing amount of flood damage. Although several plans of improvement were considered in Appendix F, Flood Control including channel widening and levees on both Black Creek and the Genesee River, no improvement plan could provide a greater amount of annual benefits than the corresponding annual cost of the considered project.

94. A realistic solution to the reduction of future flood damages in the Black Creek area would be for local authorities to prevent further construction of residential and/or commercial developments within the flood areas. In recent years there has been an increase by local governments in the use of flood plain regulation through zoning ordinances as a method of preventing future flood damages. Ideally flood plain regulation permits expensive development only in those areas which suffer no or very infrequent flooding and recommends the flood plain area for use as parks, recreation areas, wildlife refuges and other low damage developments.

95. Under the provisions of Section 206, Public Law 86-645 (Flood Control Act of 1960) Congress authorized the Corps of Engineers to compile and disseminate information on past floods and possible flood damage in order to serve as a guide to future development and a basis for avoiding future flood hazards. A number of localities of New York State have made application through the New York State Dept. of Public Works in order to obtain a flood plain information study in their area. The studies will be used to develop a regulation plan for development which will control land use within the flood plain. The regulatory controls should provide for the optimum use of the area with the minimum risk of flood damage. The actual regulation of the flood plain must be done by the local governing agencies.

96. The best solution to the increasing flood damages of the Black Creek-Genesee River area would be a flood plain information study that would enable the town of Chili officials to regulate the flood plain. A general discussion of guide lines for flood plain regulations and flood proofing practices is given in the attachment to Appendix F, Flood Control.

ONTARIO LAKE PLAIN SERVICE AREA

97. In an attempt to provide for a deficit in irrigation water supply, as shown in table B-66, an engineering inventory was made of all potential water impoundment sites on the Ontario Lake Plains. Those sites which appeared to be feasible from an engineering standpoint were analyzed further to determine their potential for supplying irrigation water.

TABLE B-66. - Projected irrigation water needs[1] by decade, Ontario Lake Plain Service Area, 1980-2020.

	1980	1990	2000	2010	2020
Acres in vegetables	26,720	27,050	27,660	28,180	27,670
Acres to be irrigated	13,360	27,050	27,660	28,180	27,670
Current deficit in acre feet of water[2]	7,910	21,600	22,210	22,730	22,220

(1) One acre-foot stored for each acre to be irrigated.
(2) Deficit beyond current irrigation water available and used.

98. IRRIGATION BENEFIT ANALYSES

The analysis can be broken into several sections. First the quantity of water necessary to irrigate an acre of cropland in this area was determined. Based upon antecedent soil moisture, probable rainfall and consumptive use by crops, a water budget was developed. This budget encompassed the water needed by the plant plus losses due to efficiency of application, transportation and storage. Ultimately, it was determined that about one acre-foot of water should be stored for each acre of land to be irrigated.

99. Next, the potential benefits due to irrigation were calculated. It was determined early in the study through the examination of partial budgets that the economic feasibility of the irrigation of crops other than vegetable and specialty crops would be doubtful. Therefore, the benefits from supplemental irrigation of a composite acre of vegetable crops were developed using projected local irrigation costs, expected yield response and project market prices.

It was determined that net benefits from the irrigation of vegetable crops in the Ontario Lake Plains would be about $21.00 per acre. This figure was used for all irrigation benefits. The acres to be irrigated from each site were then determined. The one limit to the total acres to be irrigated is the projected acres of vegetables in the Ontario Lake Plains. Then surrounding each site, the soil and topography placed another limitation. All areas capable of being irrigated by reason of appropriate soils and slopes were delineated on U. S. Geological Survey maps into groups separated by drainage needs. Only those areas requiring no drainage or random drainage were considered to be economically feasible to irrigate. This is due to the high annual cost of systematic drainage systems in relation to the expected irrigation benefits. Crop rotation systems and water transportation losses limited the remaining acreage to thirty percent of the irrigable land within one-half mile of the site or stream and not more than five miles downstream. A preliminary plan was prepared for each site and costs estimated using a capacity as near to the irrigation needs as possible.

100. In total, twenty-nine irrigation systems capable of supplying water to about 13,000 acres of land were found to have favorable benefit-cost ratios. Several of the proposed systems had benefit-cost ratios of less than one to one but were included in the list due to the fact that a slight change in either the percent of land to be irrigated or the type of crop to be irrigated could easily render them feasible within the currently acceptable limits. The sites are shown in table B-78 in Section V of this appendix.

101. Present irrigation water supplies plus the additional 13,000 acre-feet from the proposed system could irrigate 18,000 acres annually, or about 10,000 less than the total desired. This deficit could be resolved in part through several methods. Local development of smaller sites serving one or several landowners is quite feasible in many areas. These sites are not readily apparent from the maps used in the original site inventory and will require the services of field technicians to locate. In addition, there are some surface and ground water sources which are not fully developed at present. Concentration of effort on these sources along with an integrated program of group structure development could materially diminish, if not eliminate, any future deficit in irrigation water supplies on the Ontario Lake Plains.

102. Legal restrictions within the State of New York currently prohibit irrigation water developments of the type designed here. Therefore, this plan carries with it the recommendation that attempts be made to resolve these legal hindrances before any detailed local planning is initiated.

GENESEE RIVER BASIN COMPREHENSIVE STUDY

APPENDIX B - PLAN FORMULATION

SECTION V - THE BASIN PLAN

DISCUSSION

1. GENERAL

The basin plan which is presented on plate B-3 is essentially the combination of all the proposed plans that were submitted by the various Task Groups and appear in detail in Appendices C, F, H, J. L, M and N. These proposed plans are based on the population, employment and other projections developed in Appendix D , Economic Base Study.

2. The major factor that should be noted by all in addition to the criteria stated in Section I is the assumption concerning the criteria for evaluation of the considered projects. The projects in this comprehensive report were analyzed with standard Corps of Engineers or Soil Conservation Service criteria without recourse to criteria devised for special programs or objectives.

3. Another important factor that should be remembered by all is that the Coordinating Committee does not consider this proposed Basin Plan a truly comprehensive plan in the sense that all reasonable alternatives were investigated. The report represents four years of intensive data gathering but a short period of time for use of all the valuable data in formulating a plan. Therefore, the Basin Plan is a proposal, a plan, developed in a few hurried months and not in a normal formulating period of approximately eighteen months. This deficiency in accomplishing the original objectives of the study were due in part to insufficient funds, personnel restraints and deadline dates.

4. It should be recognized that recently the conception of the "Public Health Aspects of the Water Resources" development planning has been broadened. This study has not taken into account these changes. The broadening of the public health aspects resulted from the transfer of the Federal Water Pollution Control Administration from the Department of Health, Education and Welfare to the Department of the Interior and an Interdepartmental Agreement, dated 2 September 1966 between the two Departments. The Public Health Service has been assigned responsibility in the following areas of concern, namely:

(1) Vector control aspects;
(2) Epidemiology of Water born diseases; and
(3) Sanitary survey of water and related land resources.

Therefore, the Pulic Health will be consulted in the above areas of concern during the advance engineering and design phase of any of the projects in the proposed Basin Plan, if authorized for construction by the Congress.

5. IMPACT OF PLAN

The impact of the proposed plan on supplying the future demands and needs of the Basin as presented by the various Task Groups are as follows:

a. Outdoor Recreation. The plan includes 7 single-purpose upland reservoir sites, 6 multiple-purpose upland reservoir sites, 1 multiple-purpose C.E. reservoir and 8 river access sites of B.O.R. These sites combined would provide 31 percent of the projected unsatisfied needed annual recreation days for the Recreation Market Area in the year 1980 and 10 percent of the estimated unsatisfied annual recreation day needs in the year 2020.

TABLE B-67. Recreation market area supply, demand and deficit

			Recreation days (1,000's) summer season					
			1980			2020		
Agency	No.	Type	Supply	Demand	Deficit	Supply	Demand	Deficit
SCS	13	Reservoir	2,300			2,300		
CE	1	Reservoir	1,400			2,000		
BOR	8	Access site	600			600		
Other	-	Existing (1)	26,300			41,150		
			30,600	40,250	9,650	46,050	91,650	45,600

(1) Rounded from figures in Appendix M.

b. Fish and Wildlife. The plan includes 14 single-purpose upland reservoir sites, 9 multiple-purpose upland reservoir sites, 1 multiple-purpose C.E. reservoir, 1 multiple-purpose local protection project and 3 waterfowl areas. These combined reservoirs would provide fishing opportunities for 67 percent of the projected unsatisfied fisherman day needs including latent demand for the Influence Area in the year 1980 and 35 percent of the unsatisfied fisherman day needs in the year 2020.

TABLE B-68. Fish and Wildlife influence area supply, demand and deficit

Agency	No.	1980 Supply	1980 Demand	1980 Deficit	2020 Supply	2020 Demand	2020 Deficit
		Fisherman - days (1,000's)					
SCS	23	456.6			456.6		
CE	1	450.0			450.0		
Existing (1)		715.0			1,300.0		
Total		1,621.6	2,060.0	438.4	2,206.6	3,900.0	1,693.4

(1) Rounded from figures in Appendix N.

c. Water Quality. The plan includes 3 single-purpose upland reservoir sites, 1 multiple-purpose upland reservoir site and 1 multiple-purpose C.E. reservoir for water quality management. These reservoirs would eliminate water quality problems in two critical river reaches and four of the critical tributary stream reaches remaining in 1980 provided that secondary treatment is provided in all critical stream reaches as shown on plate B-2 by 1980. Direct diversion to Lake Ontario would provide the solution to the one major critical stream reach in the lower Genesee River at Rochester. The tributary reach at Silver Lake outlet at Perry is critical. Water quality improvement in this reach would be met by the re-regulation of Silver Lake outlet.

TABLE B-69. Minimum flow requirement for water quality

Stream sector	Gross c.f.s. required	Reservoir proposed Name	Agency
Genesee River			
Gates-Chili-Ogden	166	Portage	CE
Avon	93	Portage	CE
Oatka Creek			
Warsaw	3.9	18-2	SCS
Honeoye Creek			
Honeoye Falls	6.9	17-12	SCS
Mill Creek			
Wayland	0.7	13-27	SCS
Wilkins Creek			
Livonia	0.9	16-7	SCS

d. Water Supply. Local water sources are believed fully capable of meeting basin demands for rural domestic water supply. Individual well systems if organized into water supply systems should be sufficient to meet demands of the Basin's localities. The village of Warsaw is the exception to the above statement. A Soil Conservation Service reservoir, 18-7, could supply the needed water. The water supply of the metropolitan Rochester area is adequate since the area appears committed to Lake Ontario for water.

e. Irrigation. The plan includes irrigation in both the Genesee Basin and the Ontario Lake Plain Service area. In the Basin, the plan includes 1 single-purpose upland reservoir site and 2 multiple-purpose upland reservoir sites. There are approximately 49,000 acres of farm land, generally located in small, scattered areas in the northern subwatersheds which are believed to be irrigable. In 1964, about 5,200 acres were irrigated and the major source of water was natural stream flow. These 5,200 acres represent the maximum acreage that can be served adequately from existing sources. The combined proposed reservoirs in the Basin would provide 25 percent of the 1980 and 9 percent of the 2020 unsatisfied irrigation acreage demand.

TABLE B-70. Future irrigation water demand and deficit in the Basin

No.	Type	Irrigable land acres	1980 Irrigated acres	1980 Demand acres	1980 Deficit acres	2020 Demand acres	2020 Deficit acres
1	Single-purpose		690				
2	Multiple-purpose		1,670				
	Existing*		5,200				
Total		49,600	7,560	14,500	6,940	29,900	22,340

* 1964, From Appendix J.

In the Lake Ontario Plain Service Area there are proposed 29 single-purpose, upland reservoir sites. Land with soil types, slopes and drainage conditions adaptable to irrigation is estimated at about 183,000 acres. In 1964, irrigated acreage amounted to 5,450 acres and is about all that could be served from existing sources of supply. The combined 29 reservoirs would provide more than 100 percent of the 1980 and 58 percent of the 2020 unsatisfied acreage demand.

TABLE B-71. Future irrigation water demand and deficit-Lake Ontario Plain Service Area

No.	Type	Irrigable land	1980 Irrigated acres	1980 Demand acres	1980 Deficit acres	2020 Demand acres	2020 Deficit acres
29	S-P		13,000				
Existing*			5,450				
Total		183,000	18,450	13,360	-----	27,670	9,220

* 1964, From Appendix J.

The deficit shown for the year 2020 could be resolved in part through several methods. Local development of smaller sites serving one or several landowners is quite feasible in many areas. In addition, there are some surface and ground water sources which are not fully developed at present. These sources along with an integrated program of group structure development could materially diminish, if not eliminate, any future deficit in irrigation water supplies on the Ontario Lake Plains.

f. Power. The Portage Project would supply 200,000 KW for peak power demand. This hydroelectric power generation is small, both in relation to total system capacity and peak demand, but any economical hydroelectric capacity could be expected to assist in meeting future power demands.

g. Flood Control. There were three areas in the Basin having flood damages sufficient to warrant possible remedial measures. The Canaseraga Project is proposed to give 5-year summer protection to one problem area. The Red Creek Project has been authorized by the 89th-2 Congress to solve another problem area. Flood Plain Management is considered the only feasible method for the future in the Black Creek-Genesee River area of the town of Chili.

h. Land Treatment. The projections of land use in the Basin for the period 1970 to 2020 indicate a cropland acreage decline of about 21%; pasture lands decline of about 22%; forestland increase of about 21%; lands in urban use will increase about 92%; and the residual, or land in other uses including idle land and recreational land will increase 35%. The land treatment program to 1980 proposed by the Department of Agriculture would accomplish the following:

Land use	Total acreage	Acres needing treatment	Acres to be treated	% treated	Acreage remaining to be treated
Cropland	627,000	312,000	111,000	36	201,000
Pasture	240,000	154,000	42,000	27	112,000
Forest land	428,000	271,000	74,500	27	196,500

i. Erosion. The basin as a whole is not severely affected by sheet erosion, but significant benefits could be realized by the land treatment program proposed in item "h", above. Stream bank erosion along the

erosion along the main Genesee River is widespread and causes locally severe losses of cropland and buildings. Studies determined that a major bank stabilization program is not economically feasible and the Federal government does not have authority in this area, bank protection, except for emergency measures. Bank stabilization in small local areas such as the State of New York is undertaking at Belfast should be observed and if the results warrant, be encouraged at other critical locations.

j. Wetlands. Waterfowl habitat is in short supply in the Basin and there is a constant reduction of the existing habitat. Therefore, the wetlands that still exist should be saved and improved for waterfowl through acquisition and development. The Basin Plan identifies the most important wetlands that should be preserved, the shallow marshes associated with Conesus Lake and Honeoye Lake. The important wetlands of the Groveland Flats on the Canaseraga Creek and Birdsall Swamp on Black Creek have been included in the proposed Canaseraga Valley project and upland reservoir site, 7-2, respectively.

6. It can be observed from the above paragraphs that the proposed Basin Plan as shown on plate B-3 will provide only a portion of the Basin's projected needs for several purposes such as recreation, fish and wildlife and land treatment.

7. OTHER CONSIDERATIONS

The proposed Basin Plan also includes a recommendation that the "3-Rivers Rise" area at the headwaters of the West Branch of the Susquehanna, Genesee, and Allegheny Rivers be preserved in its natural state. This area should be included in the action program of the Pennsylvania Statewide Outdoor Recreation Plan.

8. The proposed Basin Plan would meet only approximately 31% of the 1980 recreation needs. There are several lakes Canandaigua, Keuka, Conesus, Honeoye, Silver, and Rushford providing water-oriented recreation opportunity, but most of their usable shorelines are in private ownership. Serious consideration should be given by the non-Federal planner to increasing public access to these lakes. Two lakes, Hemlock and Canadice, would offer exceptional recreation potential at a relatively low cost if agreements could be reached with the owner, the city of Rochester, and a non-Federal agency for the proper management and development of the water-oriented natural resource.

9. An investigation of the water level control of Conesus Lake for flooding and recreation was made in 1950 by the Corps of Engineers. The project was determined to be economically justified, but assurances of local cooperation could not be provided by the State of New

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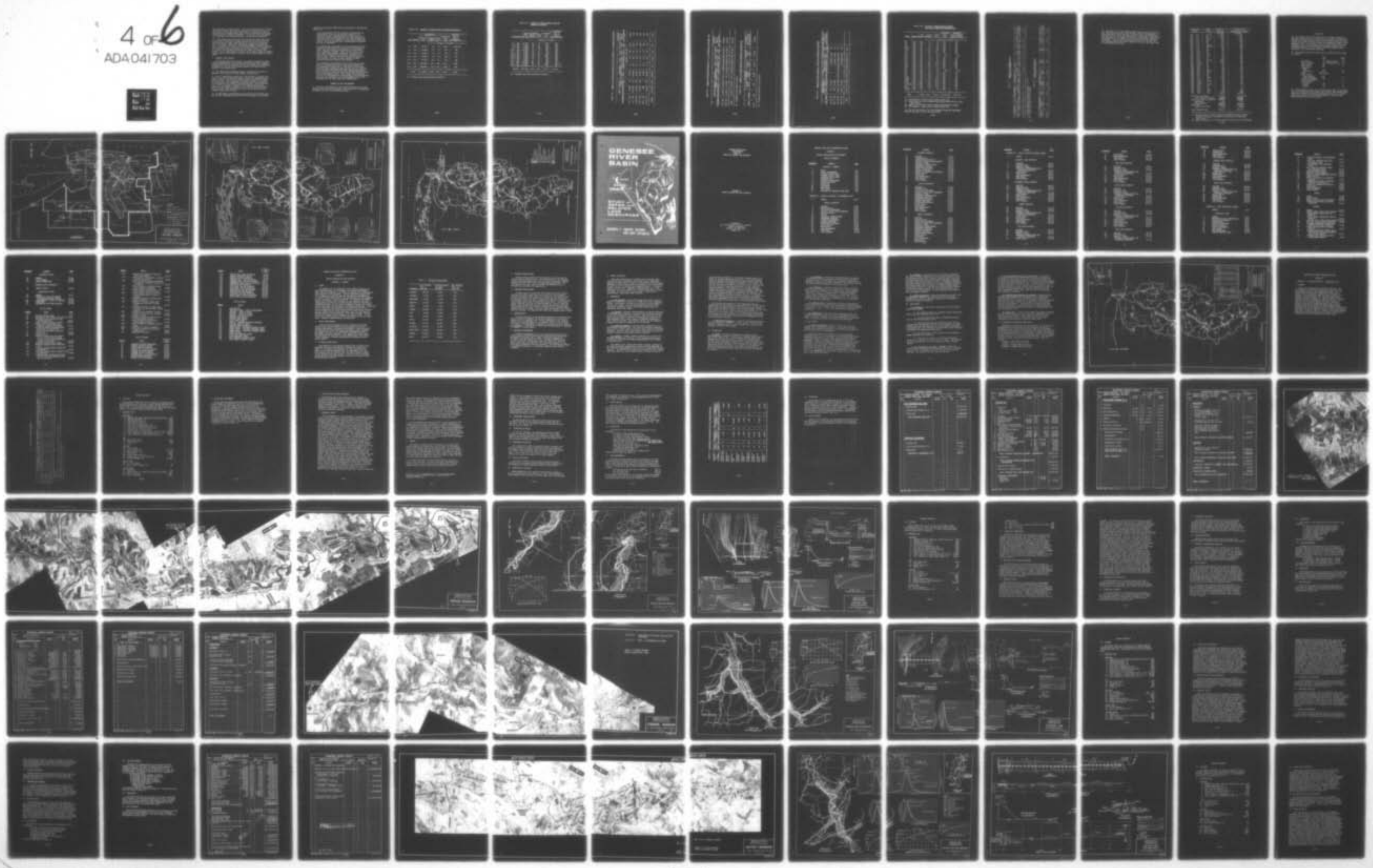

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York, Department of Public Works. The State Attorney General's Office ruled that a survey and title search would be required for each of the properties abutting Conesus Lake before the necessary assurances could be given the Federal government. It was felt that the expenditure required by the Attorney General's ruling was not justified.

10. A new damage survey was made for Conesus Lake during the study to determine if additional damages existed which could justify the cost of survey and legal work required by the past State Attorney General's ruling. There were insufficient damages to justify the cost. Inquiries were made to the Attorney General's Office concerning the ruling and it still presents a major legal barrier. Therefore, no proposal has been made concerning the control of Conesus Lake levels. If at a future date a reversal of the legal ruling is obtained, further study of the Conesus Lake water level problem should be undertaken.

11. FEDERAL PARTICIPATION

The proposed Basin Plan consists of projects eligible for major Federal participation, minor Federal participation, and no Federal participation, but all projects proposed are feasible and considered warranted for the best use of water resources and other land resources of the Genesee Basin.

12. The Portage and Canaseraga Projects proposed by the Corps of Engineers are eligible for major Federal participation.

13. Due to legislative restrictions, the majority of programs proposed by the Soil Conservation Service cannot be implemented under Public Law 566. Only those watersheds which include flood control or agricultural water management as primary purposes are eligible for construction with Federal cost participation. This means that only 5 of the proposed 35 potential Soil Conservation Service reservoirs are possibly elegible. All of the 29 potential irrigation reservoirs in the Ontario Lake Plains Service Area could be eligible under Public Law 566.

14. The Department of Agriculture has proposed the following statement for the recommended authorization for carrying out the upland

program of the Genesee River Basin as contained in the Proposed Basin Plan:

> "It is recommended that the Secretary of Agriculture be authorized to carry out the upstream aspects of the Genesee River Basin Comprehensive Plan which need to be installed to meet needs identified for 1980 and which are listed in Table J-45, Appendix J, with such modifications, thereof, as in the discretion of the Secretary of Agriculture may be advisable.
>
> "In carrying out this program, it is recommended that the Secretary of Agriculture be authorized to participate in single and multi-purpose developments for flood prevention, irrigation, drainage, water quality control, fish and wildlife developments, recreation, municipal water supply and accelerated land treatment associated with project plans. Federal technical and cost-sharing assistance should be the same as that contained in other existing authorities provided the Secretary.
>
> "The Secretary's participation should be based on project plans to be submitted to him by appropriate agencies of the Department of Agriculture. Such plans will be developed only after appropriate applications have been received by the Secretary from qualified local sponsoring organizations and will be consistent with the findings and provisions of this comprehensive plan. The planning and development work will be coordinated with other Federal and state agencies. Operation and maintenance of all developments will be the responsibility of local sponsoring organizations."

SUMMARY OF COST AND BENEFITS

15. The cost and benefits for each upland reservoir site in the proposed Basin Plan and for Ontario Lake Plain area are summarized by purpose in each of the following tables:

TABLE B-72. Summary of single-purpose recreation structures

Site	Agency	Recreation days	Recreation Annual benefit	Annual cost	Estimated total cost	Estimated cost of Federal participation
			$	$	$	$
			Amounts in $1,000			
1-5	SCS	82,700	66	83	1,682	1,230 (1)
5-1	SCS	30,000	23	41	879	439
10-2	SCS	26,600	20	18	260	130
10-14	SCS	30,000	23	18	223	112
16-2	SCS	48,700	36	31	392	196
19-11	SCS	900,000	675	420	2,761	1,380
20-2	SCS	600,000	450	284	1,963	981
Total		1,718,000	1,293	895	8,160	4,469

(1) Includes some flood prevention benefits.

TABLE B-73. Summary of single-purpose fish and wildlife structures

Site	Agency	Fish and Wildlife 1980 Man-days	Fish and Wildlife Annual benefit	Fish and Wildlife Annual cost	Estimated total cost	Estimated cost of Federal participation
			Amounts in $1,000			
3-1	SCS	21,600	114	67	1,985	993
5-21	SCS	8,600	45	12	359	180
7-1	SCS	11,200	59	22	653	327
9-3	SCS	5,800	31	28	835	418
10-3	SCS	12,200	64	9	247	124
11-4	SCS	9,200	48	16	479	240
13-1	SCS	6,000	32	26	760	380
13-22	SCS	9,400	50	34	1,007	504
13-24	SCS	5,000	26	22	652	326
14-4	SCS	9,000	47	14	419	210
14-5	SCS	9,000	47	17	498	249
17-1	SCS	20,800	107	33	983	492
17-7	SCS	12,400	65	42	1,262	631 (1)
17-8	SCS	17,200	90	17	494	247
Totals		157,400	825	359	10,633	5,321

(1) Includes some flood prevention benefits.

TABLE B-74. Summary of multiple-purpose fish and wildlife - recreation structures

Site	Agency	Fish & Wildlife Man-days	Fish & Wildlife Annual benefit	Recreation Recreation-days	Recreation Annual benefit	Total Annual benefit	Total Annual cost	Estimated total cost	Estimated cost of Federal participation
			$		$	$	$	$	$
			Amounts in $1,000						
3-4	SCS	12,500	66	97,000	73	139	108	2,137	1,069
7-2	SCS	137,000	725	160,000	120	845	123	1,915	958
8-13	SCS	22,700	120	56,000	42	162	36	466	233
13-6	SCS	19,400	100	97,000	73	173	72	1,083	542
15-2	SCS	280	2	72,000	54	56	53	802	401
17-24	SCS	20,600	109	96,000	72	181	56	614	307
Totals		212,500	1,122	578,000	434	1,556	448	7,017	3,510

TABLE B-75. Summary of multiple-purpose F & W - irrigation structures (1)

Site	Agency	Fish and Wildlife: Man-days	Fish and Wildlife: Annual benefit	Irrigation: Storage A-ft.	Irrigation: Annual benefit	Total annual benefit	Total annual cost	Estimated total cost	Estimated cost of Federal participation
			$		$	$	$	$	$
11-2	SCS	34,300	178,500	1,100	41,000	219,000	21,000	315,000	158,000
19-7	SCS	12,400	42,000	570	18,000	60,000	23,700	450,000	225,000
Total		46,700	220,500	1,670	59,000	279,000	44,700	765,000	383,000

(1) Irrigation structures in Basin.

TABLE B-76. Summary of single-purpose irrigation structure (1)

Site	Agency	Irrigation: Storage A-ft.	Irrigation: Annual benefit	Irrigation: Annual cost	Estimated total cost	Estimated cost of Federal participation
			$	$	$	$
17-19	SCS	690	22,100	12,100	357,000	178,600

(1) Irrigation structure in the Basin.

TABLE B-77. Summary of water quality - fish and wildlife structures

Site	Agency	Water Quality		F & W		Total	Total	Estimated	Estimated cost
		Storage	Annual		Annual	annual	annual	total	of Federal
		A-ft.	benefit	Man-days	benefit	benefit	cost	cost	participation
			$		$	$	$	$1,000	
13-27	SCS	230	13,500	-	-	13,500	9,200	273	
16-7	SCS	328	10,000	-	-	10,000	5,300	157	
17-12	SCS	6,660	20,000	40,000	141,000	161,000	28,200	702	
18-2	SCS	1,488	37,500	-	-	37,500	10,400	308	
Total		8,706	81,000	40,000	141,000	222,000	53,100	1,440	

TABLE B-78. Summary of single-purpose Ontario Lake Plain irrigation structures (1)

Site	Agency	A-ft. supplied	Annual benefit	Annual cost	Estimated total cost	Estimated cost of Federal participation
			Amounts in $1,000			
B-2	SCS	204	4.2	3.4	76	38
B-7	SCS	300	6.5	5.8	125	63
B-9	SCS	190	4.1	4.1	98	49
B-17	SCS	340	7.4	6.0	116	58
B-20A	SCS	513	11.1	10.8	230	115
B-21	SCS	540	11.7	9.0	173	87
C-3	SCS	780	16.9	19.4	546	273
C-4	SCS	324	7.0	4.3	93	47
C-12	SCS	300	6.5	8.0	- (2)	- (2)
D-6	SCS	152	3.3	3.9	94	47
D-7	SCS	267	5.8	4.3	126	63
D-12	SCS	372	8.1	5.6	113	56
E-4	SCS	520	11.3	8.0	212	106
E-6	SCS	387	8.4	11.0	327	164
E-19	SCS	800	17.3	13.7	245	123
E-20	SCS	400	8.7	6.8	178	89
F-5	SCS	173	3.8	3.2	65	33
F-6	SCS	400	8.7	9.3	- (2)	- (2)
G-3	SCS	384	8.3	3.9	112	56
G-4	SCS	278	6.0	5.0	133	67
G-6	SCS	500	10.8	6.3	144	72
B-24)	SCS	230	5.0	6.7	116	58
C-8A(	SCS	519	11.2	10.7	195	98
C-11)	SCS	604	13.1	12.9	247	124
C-13(	SCS	216	8.1	8.1	185	93
D-2)(3)	SCS	1,780	38.6	22.9	317	159
D-4 (	SCS	800	17.3	12.5	277	139
D-8)	SCS	332	7.2	7.1	119	59
G-12A)	SCS	376	8.2	7.9	193	97
Total		12,981	284.6	240.6	5,185 (1)	2,593 (4)

(1) From Appendix J Agricultural Studies Table J-50.
(2) These sites were cost estimated from curves which did not yield this figure.
(3) Systems with channels and/or external distribution systems.
(4) From Appendix J Agricultural Studies Table J-45.

16. The cost and benefits for the proposed Portage and Canaseraga Projects are shown in the following tables:

TABLE B-79. Summary of the Portage Reservoir
($ amounts in 1,000's)

Recreation			Fish & Wildlife			Water Quality		Power						
Recreation days	Annual benefit	Annual cost	Man-days	Annual benefit	Annual cost	Annual benefit	Annual cost	Annual Energy mwh	Annual benefit	Annual cost	Total annual benefit	Total annual cost	Estimated total first cost	Estimated cost of Federal participation
	$	$		$	$	$	$		$	$	$	$	$	$
1,400,000*	2,689**	2,664	400,000	275	***	138	130	412,400	4,766	2,946	7,868	5,740	91,005	85,715

* Initial visitation; 2,000,000 total future visitation
** Includes $89,000 for downstream benefits
*** Included with annual cost for Recreation

TABLE B-80. Summary of Canaseraga Project
($ amounts in 1,000's)

Fish and Wildlife			Flood Control					
Waterfowl days	Annual benefit	Annual cost	Annual benefit	Annual cost	Total annual benefit	Total annual cost	Estimated total first cost	Estimated cost of Federal participation
	$	$	$	$	$	$	$	$
2,797,000	197.9	140.0	194.9	190.0	392.8	330.1	7,466.0	6,657.0

17. The total cost of the Proposed Basin Plan, plate B-3, for 35 upland reservoirs and a main stem reservoir, would be $125,656,000. A local protection project and land treatment would cost $20,610,000. The total cost for the Basin Plan would be $146,266,000. Twenty-nine SCS reservoirs for irrigation in the Ontario Lake Plain would cost $5,185,000. Thus the total proposed plan would cost $151,451,000. The following table B-81 gives a summary of cost for each major item in the proposed Basin Plan.

Development Site	Needs met (1)	Estimated total cost	Estimated cost Federal participation
		($1,000)	($1,000)
SCS 1-5	Rec,FP	$ 1,682	$ 1,230
SCS 3-1	FW	1,985	993
SCS 3-4	Rec,FW	2,137	1,069
SCS 5-1	Rec	879	440
SCS 5-21	FW	359	180
SCS 7-1	FW	653	327
SCS 7-2	Rec,FW	1,915	958
SCS 8-13	Rec,FW	466	233
SCS 9-3	FW	835	418
SCS 10-2	Rec	260	130
SCS 10-3	FW	247	124
SCS 10-14	Rec	223	112
SCS 11-2	I,FW	315	158
SCS 11-4	FW	479	240
SCS 13-1	FW	760	380
SCS 13-6	Rec,FW	1,083	542
SCS 13-22	FW	1,007	504
SCS 13-24	FW	652	326
SCS 13-27	WQ	273	---
SCS 14-4	FW	419	210
SCS 14-5	FW	498	249
SCS 15-2	Rec,FW	802	401
SCS 16-2	Rec	392	196
SCS 16-7	WQ	157	---
SCS 17-1	FW	983	492
SCS 17-7	FW,FP	1,262	794
SCS 17-8	FW	494	247
SCS 17-12	WQ,FW	702	---
SCS 17-19	I	357	179
SCS 17-24	Rec,FW	614	307
SCS 18-2	WQ	308	---
SCS 18-7	MI	484	---
SCS 19-7	FW,I	450	225
SCS 19-11	Rec	2,761	1,380
SCS 20-2	Rec	1,963	982
SCS Basin Sub-totals		$ 28,856	$ 14,026 (2)
C of E Portage Reservoir		96,800	91,225
Basin Sub-total for reservoir		$125,656	$105,251
Canaseraga		7,699	6,865
Land treatment		12,911	---
BASIN TOTAL		$146,266	$112,116
Ontario Lake Plain		5,185	2,593
TOTAL PROPOSED PLAN		$151,451	$114,709

(1) Rec-Recreation; FP-Flood Prevention; WQ-Water Quality Control; FW-Fish & Wildlife; I-Irrigation; MI-Municipal or Industrial Water Supply.

(2) Based on current P.L. 566 Cost Sharing Criteria for these purposes.

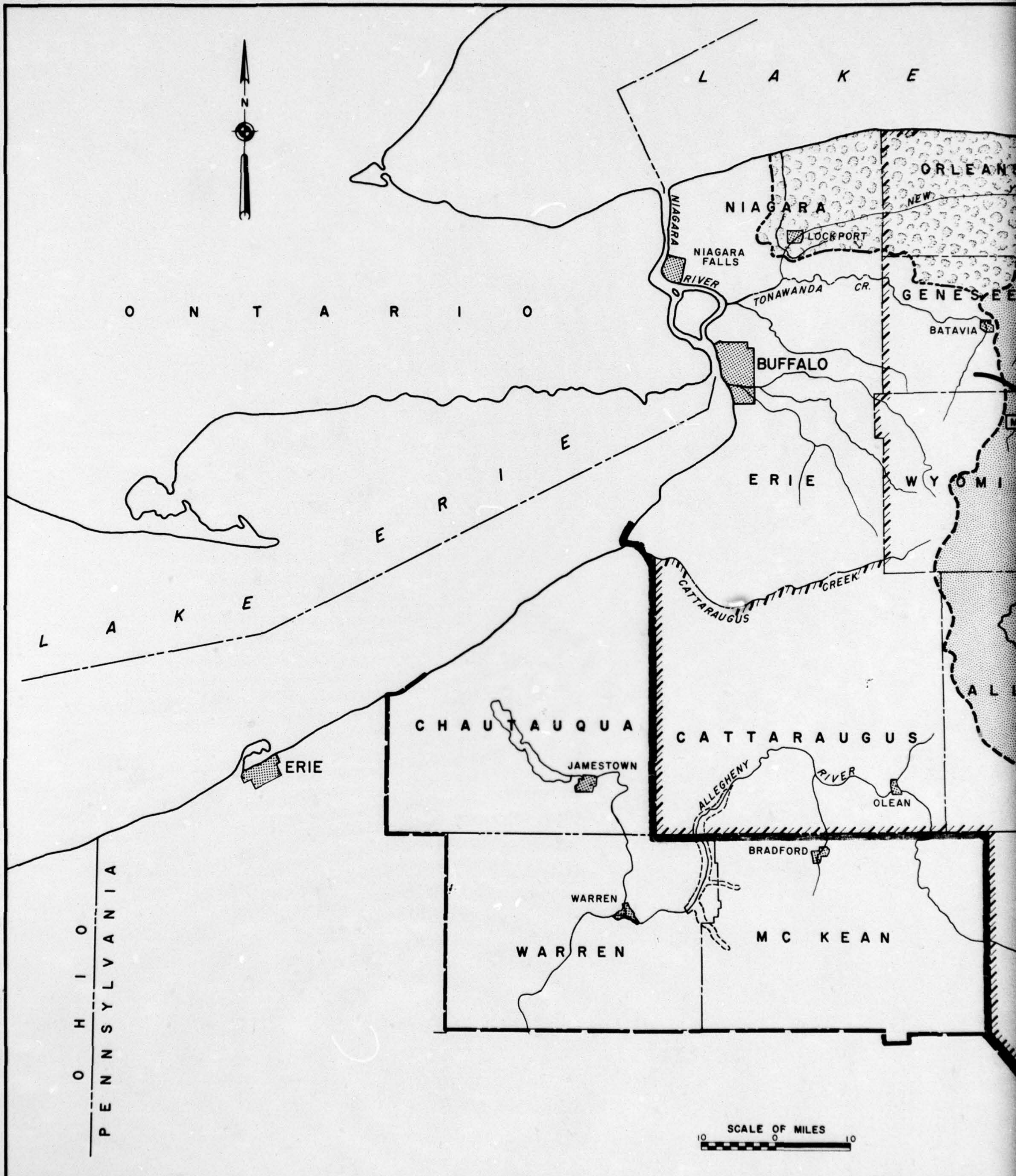
CONCLUSION

18. The Proposed Basin Plan consisting of 35 upland reservoirs; one major multiple-purpose reservoir for recreation, power and water quality, the Portage Project; one multiple-purpose local flood protection and waterfowl habitat project, the Canaseraga Project; three waterfowl areas, 8 river access sites for boating; one flood plain management area; an agricultural land treatment program; and 29 irrigation reservoirs on the Ontario Lake Plains Service Area is considered to be economically feasible.

19. The Proposed Basin Plan would meet the identified Basin needs as follows:

	1980		2020
Recreation	31%	(market area)	10%
Fish & Wildlife	67	(influence area)	35
Water Quality	100		--
Water Supply	100		--
Irrigation			
Basin	25		9
Lake Plains	100		58
Power	minor amount		
Flood Control			
Local Projects	100		--
Flood Management	100		--
Erosion (Streambank)	0		--
Land Treatment			
Cropland	36		--
Pasture	27		--
Forest	27		--

20. The plan does not meet all of the projected needs of the Basin, but it has identified and included those projects and programs which would have a benefit-to-cost ratio greater than unity. It should serve as a guide for the orderly development of the water and related land resources of the Basin.



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ERIE
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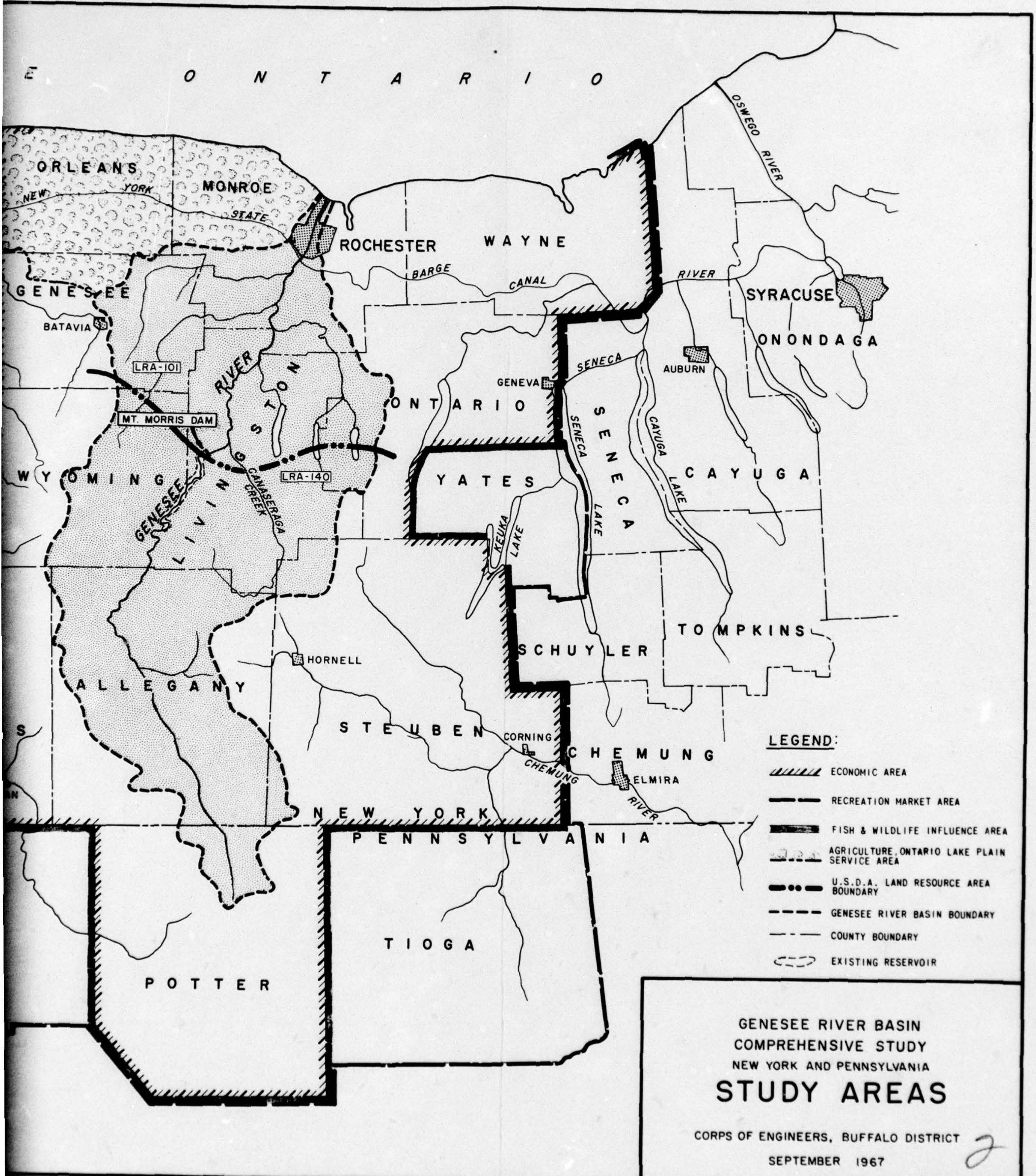

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

STUDY AREAS

CORPS OF ENGINEERS, BUFFALO DISTRICT
SEPTEMBER 1967

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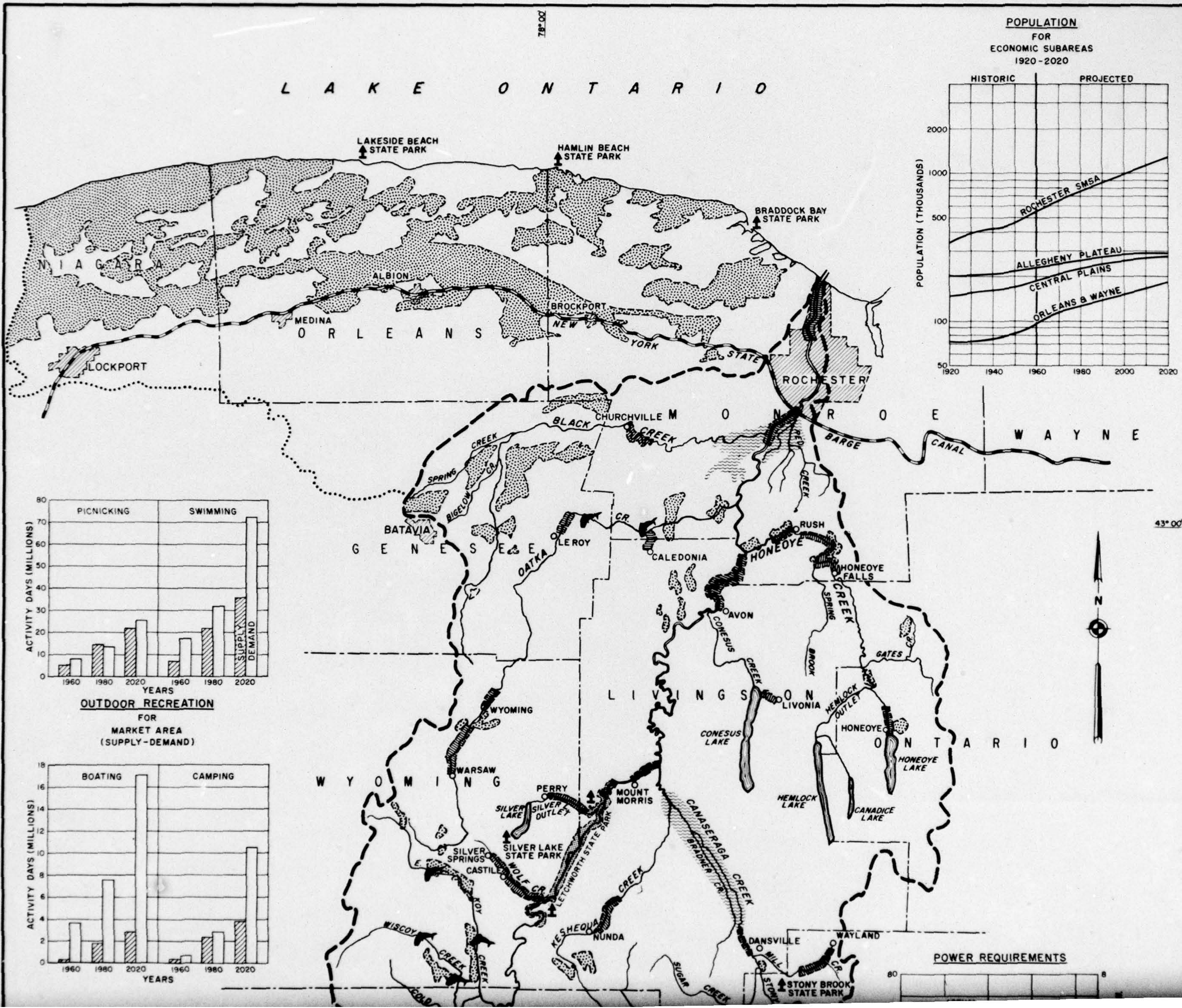
PLATE B1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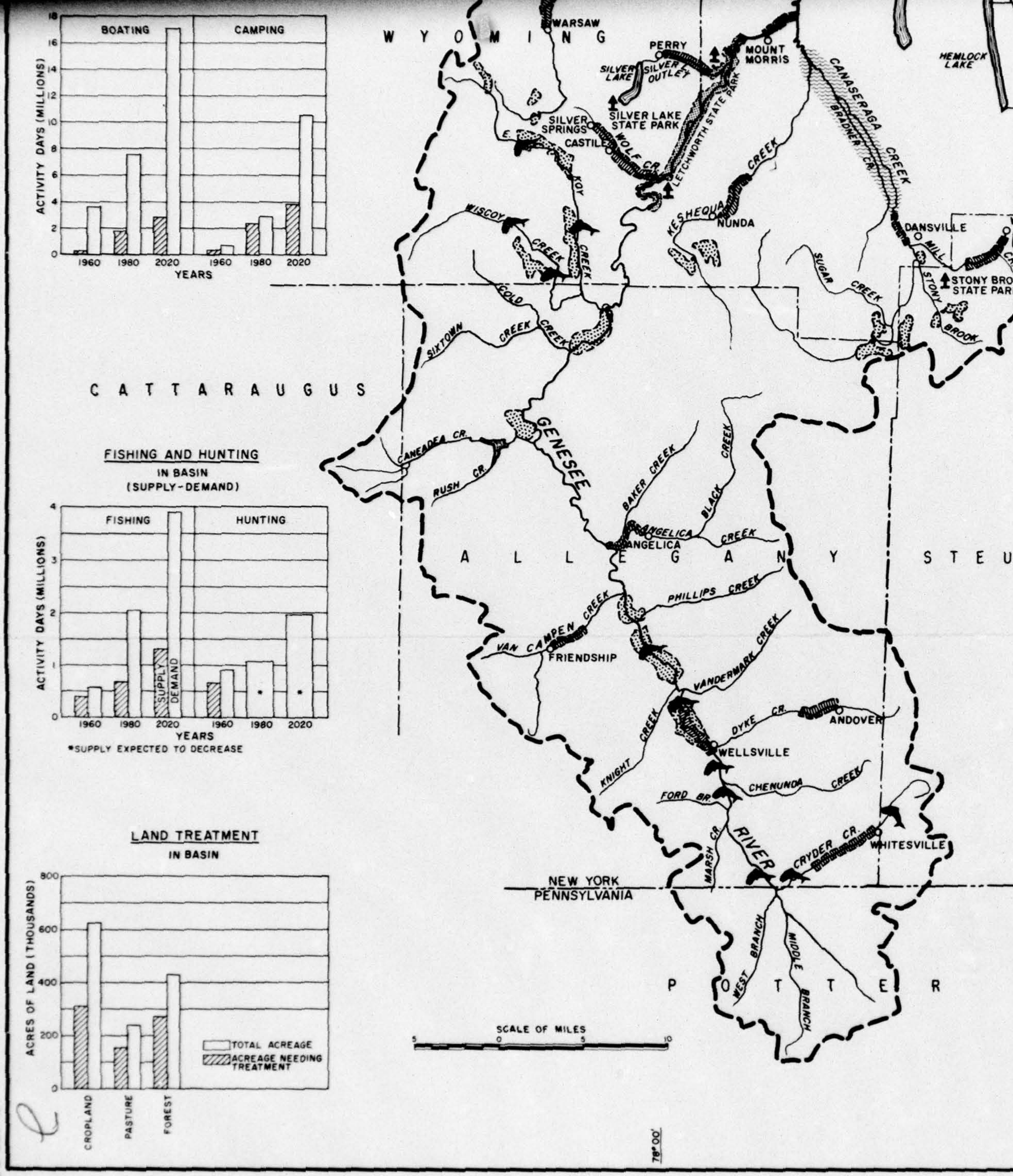
CENTRAL PLAINS
ORLEANS & WAYNE
LAKESIDE BEACH STATE PARK
HAMLIN BEACH STATE PARK
BRADDOCK BAY STATE PARK
NIAGARA
ORLEANS
MONROE
WAYNE
GENESEE
LIVINGSTON
ONTARIO
WYOMING
LOCKPORT
MEDINA
ALBION
BROCKPORT
NEW YORK STATE BARGE CANAL
ROCHESTER
CHURCHVILLE
BLACK CREEK
SPRING CREEK
BIGELOW CR.
BATAVIA
OATKA CR.
LE ROY
CALEDONIA
RED CREEK
RUSH
HONEOYE CREEK
HONEOYE FALLS
SPRING BROOK
AVON
CONESUS CREEK
CONESUS LAKE
LIVONIA
HEMLOCK OUTLET
GATES
HONEOYE
HONEOYE LAKE
HEMLOCK LAKE
CANADICE LAKE
WYOMING
WARSAW
PERRY
SILVER LAKE
SILVER LAKE OUTLET
SILVER LAKE STATE PARK
MOUNT MORRIS
LETCHWORTH STATE PARK
SILVER SPRINGS
CASTILE
WOLF CR.
E. KOY
WISCOY CREEK
KESHEQUA CREEK
NUNDA
CANASERAGA CREEK
BRADNER CR.
SUGAR CREEK
DANSVILLE
MILL CR.
STONY BROOK STATE PARK
WAYLAND
N
OUTDOOR RECREATION
FOR
MARKET AREA
(SUPPLY-DEMAND)
ACTIVITY DAYS (MILLIONS)
PICNICKING
SWIMMING
SUPPLY
DEMAND
BOATING
CAMPING
YEARS
1960
1980
2020
POWER REQUIREMENTS



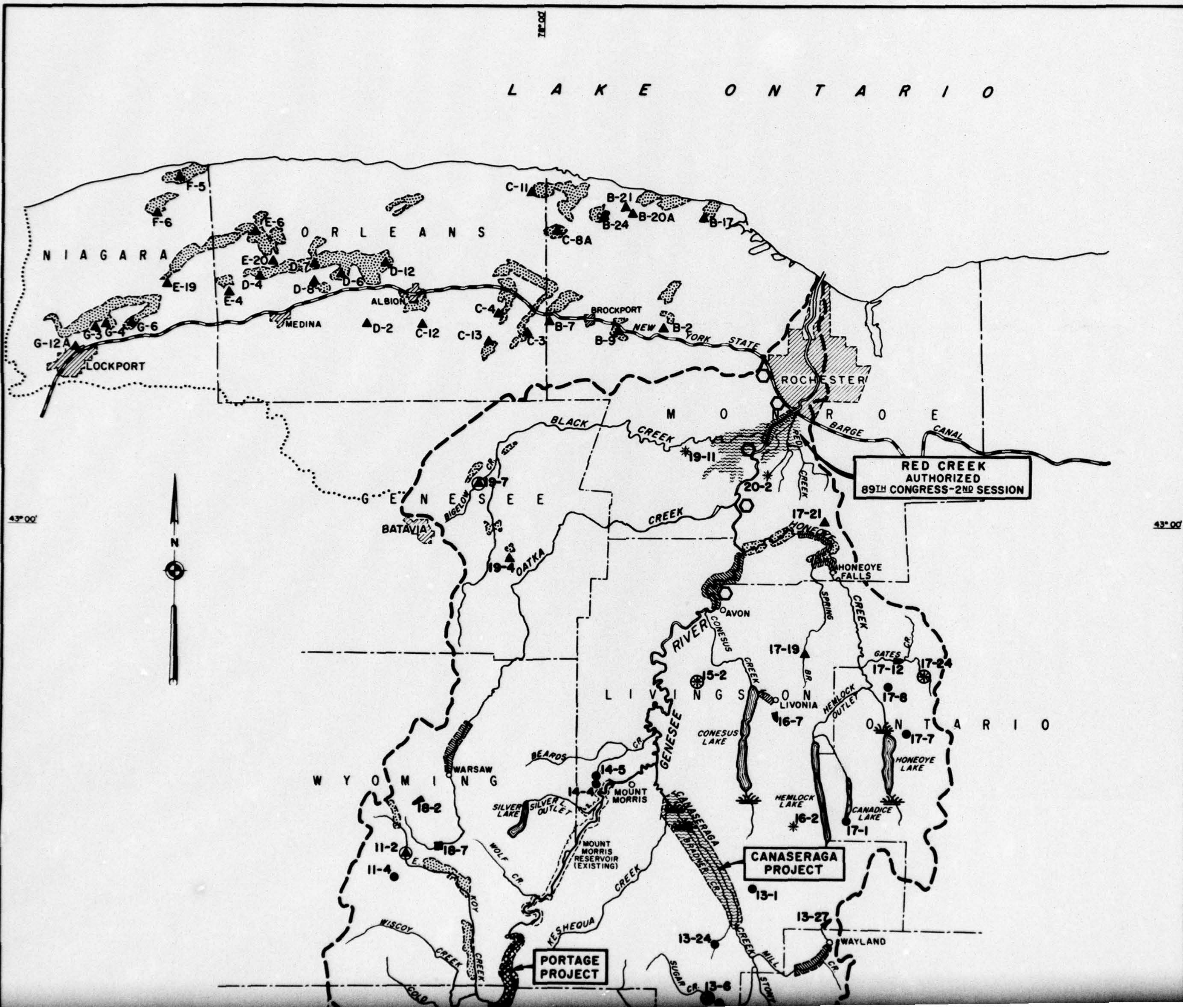
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

BASIN RESOURCES AND NEEDS

CORPS OF ENGINEERS, BUFFALO DISTRICT

SEPTEMBER 1967

PLATE B2


LAKE ONTARIO
NIAGARA
ORLEANS
MONROE
GENESEE
LIVINGSTON
WYOMING
ONTARIO
LOCKPORT
MEDINA
ALBION
BROCKPORT
NEW YORK STATE BARGE CANAL
ROCHESTER
BATAVIA
AVON
HONEOYE FALLS
LIVONIA
MOUNT MORRIS
WARSAW
WAYLAND
BLACK CREEK
OATKA CREEK
BIGELOW CR.
HONEOYE CREEK
SPRING BR.
GATES CR.
CONESUS CREEK
GENESEE RIVER
CANASERAGA CREEK
BRADNER CR.
MILL CREEK
STONY
SUGAR CR.
KESHEQUA CREEK
WOLF CR.
BEARDS CR.
SILVER LAKE
SILVER L. OUTLET
CONESUS LAKE
HEMLOCK LAKE
HEMLOCK OUTLET
CANADICE LAKE
HONEOYE LAKE
MOUNT MORRIS RESERVOIR (EXISTING)
KOY CREEK
WISCOY CREEK
RED CREEK
RED CREEK AUTHORIZED 89TH CONGRESS-2ND SESSION
CANASERAGA PROJECT
PORTAGE PROJECT
N
78°00'
43°00'
F-5
F-6
E-6
E-19
E-20
E-4
D-4
D-7
D-8
D-6
D-12
D-2
C-12
C-13
C-4
C-3
C-11
C-8A
B-7
B-9
B-2
B-21
B-24
B-20A
B-17
G-12A
G-3
G-4
G-6
19-11
19-7
19-4
20-2
17-21
17-19
17-12
17-24
17-8
17-7
17-1
16-7
16-2
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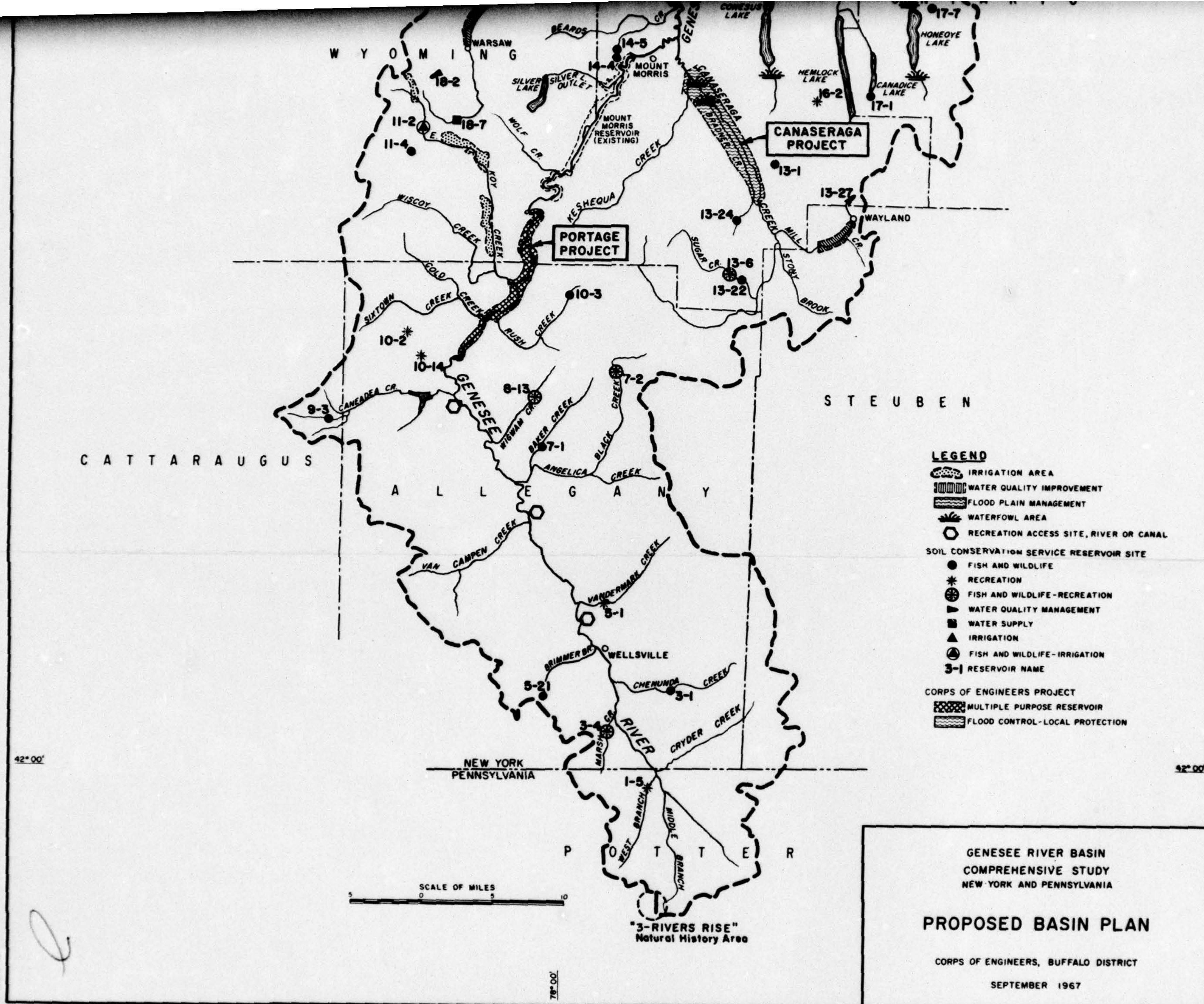
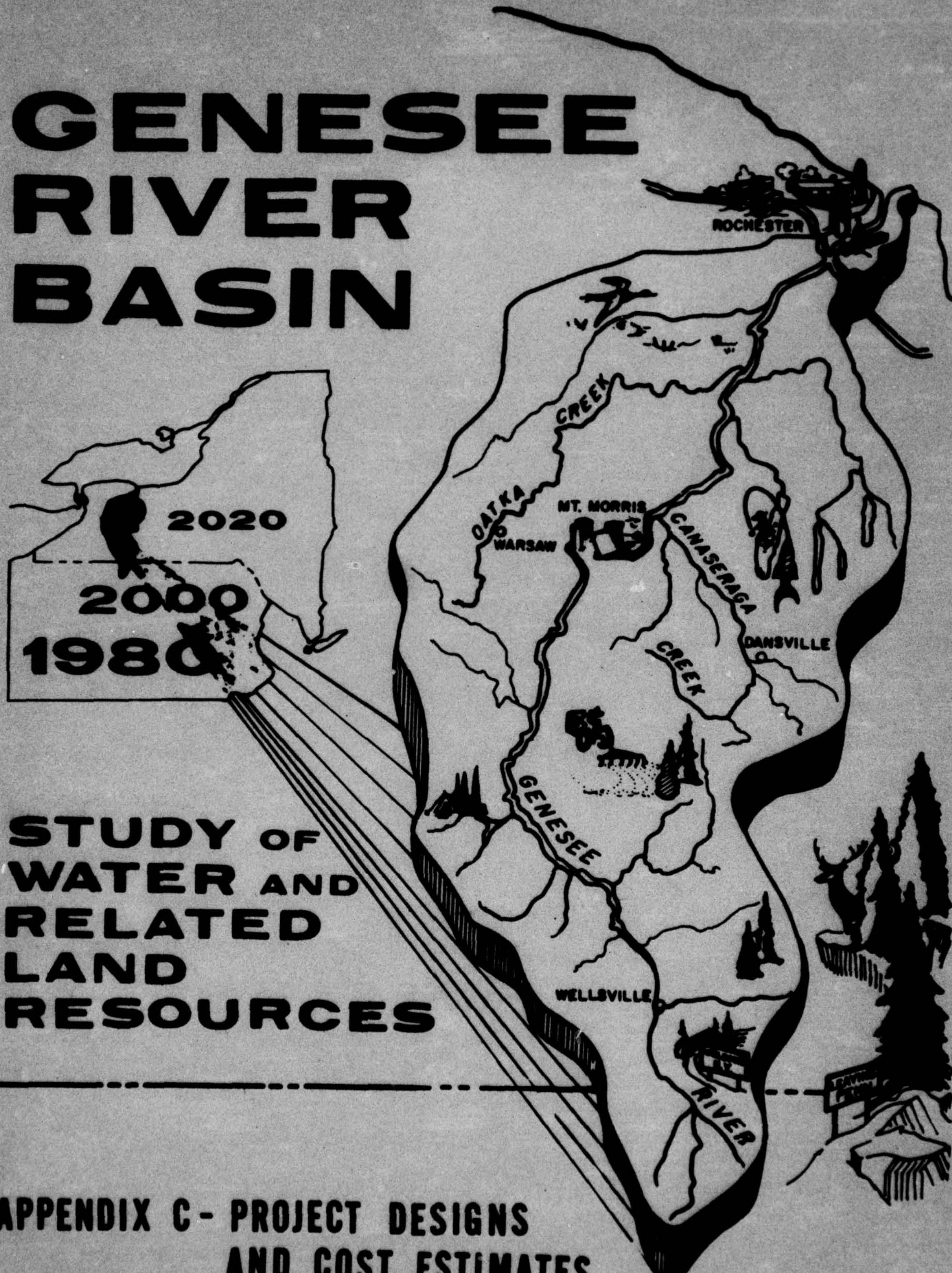
11-2
11-4
13-1
13-24
13-27
13-6


WYOMING
WARSAW
18-2
18-7
11-2
11-4
BEARDS
14-5
14-4
MOUNT MORRIS
SILVER LAKE
SILVER L. OUTLET
MOUNT MORRIS RESERVOIR (EXISTING)
WOLF CR.
KOY
WISCOY CREEK
KESHEQUA CREEK
PORTAGE PROJECT
COLD CREEK
SIXTOWN CREEK
RUSH CREEK
10-3
10-2
10-14
GENESEE
CANEADEA CR.
9-3
8-13
WIGWAM CR.
BAKER CREEK
7-1
7-2
BLACK CREEK
ANGELICA CREEK
CATTARAUGUS
ALLEGANY
VAN CAMPEN CREEK
VANDERMARK CREEK
3-1
WELLSVILLE
BRIMMER BR.
5-21
CHENUNDA CREEK
3-4
MARSH CR.
RIVER
CRYDER CREEK
NEW YORK
PENNSYLVANIA
1-5
WEST BRANCH
MIDDLE BRANCH
POTTER
"3-RIVERS RISE"
Natural History Area
SCALE OF MILES
5 0 5 10
42°00'
78°00'
CONESUS LAKE
HEMLOCK LAKE
16-2
CANADICE LAKE
17-1
HONEOYE LAKE
17-7
CANASERAGA
BRADNER CR.
CANASERAGA PROJECT
13-1
13-27
WAYLAND
13-24
MILL CREEK
STONY BROOK
SUGAR CR.
13-6
13-22
CR.
STEUBEN
LEGEND
IRRIGATION AREA
WATER QUALITY IMPROVEMENT
FLOOD PLAIN MANAGEMENT
WATERFOWL AREA
RECREATION ACCESS SITE, RIVER OR CANAL
SOIL CONSERVATION SERVICE RESERVOIR SITE
FISH AND WILDLIFE
RECREATION
FISH AND WILDLIFE-RECREATION
WATER QUALITY MANAGEMENT
WATER SUPPLY
IRRIGATION
FISH AND WILDLIFE-IRRIGATION
3-1 RESERVOIR NAME
CORPS OF ENGINEERS PROJECT
MULTIPLE PURPOSE RESERVOIR
FLOOD CONTROL-LOCAL PROTECTION
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
PROPOSED BASIN PLAN
CORPS OF ENGINEERS, BUFFALO DISTRICT
SEPTEMBER 1967
PLATE B3

GENESEE RIVER BASIN



STUDY OF WATER AND RELATED LAND RESOURCES

APPENDIX C - PROJECT DESIGNS AND COST ESTIMATES

GENESEE RIVER BASIN
COMPREHENSIVE
STUDY OF
WATER AND RELATED LAND RESOURCES

APPENDIX C
PROJECT DESIGNS AND COST ESTIMATES

Prepared by
U.S. Army Engineer District, Buffalo
Corps of Engineers
Buffalo, New York 14207
August 1967

GENESEE RIVER BASIN COMPREHENSIVE STUDY

APPENDIX C

PROJECT DESIGNS AND COST ESTIMATES

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GENESEE RIVER BASIN COMPREHENSIVE STUDY

APPENDIX C

PROJECT DESIGNS AND COST ESTIMATES

SECTION I - GENERAL

1. SCOPE

The designs and cost estimates of the physical features for each proposed element of the Genesee River Basin Comprehensive Study that were assigned to the Corps of Engineers for investigation are presented in this appendix. The data concerning designs and cost estimates for physical features assigned for investigation to the Soil Conservation Service are not presented in this appendix, but may be found in Volume VI, Appendix "J," Agricultural Studies. Designs and detailed cost estimates for this appendix were made using general principles of accepted design practices described in engineering manuals of the Corps of Engineers together with design criteria and basic data described in subsequent paragraphs. Quantities for the structures were determined from generalized curves of typical comparable structures and are based on geological sections. Of the fourteen phase I sites considered, ten were considered unfeasible based on Corps standards. Four sites, Portage, Belfast, Stannard and Angelica were considered as phase II sites. Of the four sites, Portage appears to offer more potential than the other sites. Figure C1 shows location of reservoirs.

2. DESIGN REQUIREMENTS

Basic data and information for such features as spillway design flood, diversion flows, various reservoir levels for storage requirements, downstream water demands, local protection and hydroelectric power facilities applicable to each reservoir and damsite included in the recommended Comprehensive plan of development of water resources in the Genesee River Basin have been developed and described in other appendices to this report. A brief statement of design requirements for ultimate project design follows.

3. SPILLWAY DESIGN FLOOD

Determination of the spillway design flood for each of the reservoir sites was accomplished by applying the design storm runoff to the inflow unit hydrograph at each reservoir site. Based on the spillway design flood, the topography of the dam, the reservoir and the spillway site, the most economical length of the spillway crest was selected. Pertinent data on spillway design floods and spillway designs for each of the phase I sites are presented in table C1.

TABLE C1. - Spillway design floods

Reservoir	Max. Probable Flood Max. CFS	Spillway Design Discharge Max CFS	Max. Probable Flood Res. Elev. ft.
Stannard	189,856	116,000	1625
Chenunda	67,200	50,500	1695
Vandermark	59,600	41,000	1697
Angelica	114,694	69,000	1595
Summit	67,600	3,220	1715
Belfast	295,689	262,000	1375
Cold	93,800	59,800	1395
Rush	82,550	60,000	1394
Wiscoy	151,000	120,000	1416
Portage	359.241	310,000	1196
Tuscarora	125,700	72,000	815
Poag's Hole	131,900	117,000	994
Honeoye	118,600	102,000	800
Oatka	110,400	88,500	725

4. STANDARD PROJECT FLOOD

Standard project flood determinations were made for both the Portage and the Stannard sites. The determination of the standard project flood was computed by using the Corps of Engineers computer program 23-J2-J228 Unit Graph and Hydrograph Computations. The peak flow of the S.P.F. for the Portage and Stannard sites is 145,900 cfs and 85,830 cfs respectively.

5. RESERVOIR DESIGN FLOOD

For those phase II reservoirs which would have flood control, the reservoir design flood was obtained with the use of volume-duration-frequency curves (which are available at the Buffalo Corps of Engineers Office) and area-capacity curves for each reservoir. The duration time is the time it requires to lower the reservoir from flood control pool, down to conservation pool level. The reservoir design flood for the phase II projects would be a 50-year flood for Portage, (the Portage site does not provide significant additional flood protection for areas already protected by the existing single-purpose Mount Morris Dam), a 200-year flood for Stannard and a 10-year flood for Belfast. The Angelica site would have neglible flood control.

6. SEDIMENTATION

The trap efficiency of each proposed reservoir was estimated from data on method of operation and physical properties of the dam and conditions in the upstream area. Using information on the expected quantity and characteristics of the sediment carried by the stream, the effect of the deposition of sediment on reservoir storage capacity was evaluated. A discussion of source data and procedures is contained in APPENDIX K of this report.

7. FREEBOARD REQUIREMENTS

Freeboard requirements of each of the projects were based on a recent estimate of wind criteria, wave height and wave runup value developed in connection with a study of freeboard adequacy of Mt. Morris Dam, Mt. Morris, New York. The study utilized recent criteria set forth in Engineering Technical Letter No. 1110-2-8, Corps of Engineers and indicated that a minimum freeboard of five feet would be sufficient for each reservoir. For the detailed design of recommended projects, an individual freeboard study would be necessary

8. OUTLET CAPACITIES

The outlet works would be designed for a discharge under conservation pool conditions, which would allow a reasonable reservoir draining time but would not exceed bank-full conditions downstream. Each conduit would be controlled by two slide gates. One gate would be in reserve for emergency closure. To insure a mixture of water with a temperature approximating the natural temperature during low flows and to improve water quality during low flows, the outlet works would include an upper gate at approximately conservation pool elevation.

9. RESERVOIRS

a. Map Coverage - All of the Genesee River Basin has been mapped to a scale of 1:62,500 or 1:24:000 by the U.S. Geological Survey. Each project is within an area which has been mapped to a scale of 1:24,000. All elevations shown are based on data from these topographic maps or from field surveys using U.S. Geological Survey bench marks.

b. Storage - Reservoir area-elevation and capacity-elevation relationships were prepared by planimetering successive contours on the best topographic maps available. Dams were sized on the basis of these curves to provide the storages as needed for low flow supplementation, flood control and sediment accumulation over a 100-year period. Area-capacity curves for the respective prospects are shown on figures C3, C6, C9 and C12.

c. Reservoir Clearing - Clearing will be required on all lands below an elevation of 5 feet above the maximum conservation pool and will include removal of trees, brush, fences and existing buildings. Specific areas desginated by recreation and fish and wildlife interests would require special clearing.

d. Geology - Geologic studies consisted of a review of the geologic literature of the basin, brief reconnaissance surveys of potential dam sites, and limited explorations (core borings) at selected sites.

The region of the Genesee River Basin includes a portion of the Central Lowlands physiographic province and the highlands of the Glaciated Allegheny Plateau section of the Appalachian Plateaus province. The land surface slopes gently toward the north ranging from about 2500 feet at the southern limit to about 246 feet at

the Lake Ontario shoreline. The surface features consist of a series of terraces (named the Erie, Huron, and Ontario planes) which are separated by northwest facing escarpments (named the Portage, Onondaga, and Niagara escarpments). As a result, the outcrop belts are in an east-west direction across the area with the more resistant formations marking the low but sometimes abrupt escarpments. The bedrock consists of Middle Paleozoic (Ordovician, Silurian, and Devonian) age sedimentary formations - shales, siltstones, sandstones, limestones, and dolomites. The strata dip southward between 40 and 60 feet per mile and have been only slightly disturbed by orogenic forces. It appears that the crustal folding that took place in northern Pennslyvania during the Appalachian Revolution in the Permian time continued into the Genesee River Basin area as minor anticlines and synclines.

The advance and recession of the Pleistocene glaciers changed the drainage patterns of western New York. In the Genesee River Basin area stream channels were filled by glacial debris which caused blockages of flow in the existing channel in some areas and resulted in some new stream channels being formed. An example of a very young valley in the Genesee River Basin formed as a result of glacial blockage is the Portage Canyon downstream of Portageville. The former channel east of Portageville is now filled with glacial debris.

e. Recreation Facilities - A study of recreational development is presented in APPENDIX M of this report. Since the only proposed recommended project is the Portage site, the study was generally limited to that project.

10. RELOCATIONS

a. Roads - It would be necessary to provide the area surrounding each reservoir project with a highway service equivalent to the existing one. Cost estimates for the Belfast and Stannards sites were supplied by the Hornell District Office, New York State Department of Public Works. Road relocation costs for the Portage and Angelica sites were made by this office using current bid prices for similar work, taken from the American General Contractors Association low bidders and estimates by New York State Department of Public Works for the sites at Stannards and Belfast.

b. Railroads - The estimates include amounts for raising or relocating operating railroad lines that are in proposed reservoir areas. In this report the railroads involved are the Wellsville, Addison and Galeton Railroad at the Stannard site and the Erie-Lackawanna Railroad at the Belfast site.

c. Pipelines - Pipelines relocations include a 14-inch and two 20-inch gaslines at the Portage site. At the Stannard site a 14-inch, a 20-inch and a 6-inch gasline would require relocation. To be in accordance with the previous NENYIAC study, which proposed the relocation, a 14-inch and a 10-inch gasline would be relocated at the Belfast site. The above relocations and cost estimates of relocations were in accordance with the desires of the owners.

d. Utility lines - Relocation of electrical transmission lines which cross the Stannard and Portage sites would be required. At the Portage site a 34.5KV. line and a 115KV. line would require relocating. A 4800 V. line at the Stannard site would need relocating.

e. Cemeteries - There are several cemeteries within the reservoir areas of the phase II sites which would have to be moved. Although relocation costs were calculated on a per grave basis, the number of graves per cemetery were estimated.

11. DAM DESIGN

a. Type of structure - Portage was the only phase II project with a concrete gravity dam. In this case, standard overflow and non-overflow sections were adopted on the basis of generalized stability computations.

All other phase II dams would be of the rolled-earth embankment type. On the upstream face, the lower portion of the embankment would have a 1V:3H slope, while the upper portion would have a slope of 1V:2.5H. The upstream face, of the embankment, would be protected by 24 inches of riprap on 9 inches of bedding. Although the structure would be provided with an impervious core, for further protection against seepage, the impervious core would have a 10-inch layer of gravel ly sand which would extend to the bottom of the structure and then continue as a 4-inch layer to the rock-filled toe at the downstream face. The **downstream** face would have a slope of 1V on 2.5H. The crest width would be 20 feet.

b. Spillways - Spillways would be a concrete ogee-shaped weir with a vertical upstream face and would be designed to pass the maximum probable flood. With the spillway crest or the top of gates known and with the desired maximum reservoir elevation, the crest length was determined by trial. The maximum probable flood was routed through a range of spillway lengths to determine the minimum length that would pass the maximum probable flood. The routing of the M.P.F. was done with the Puls method starting at full pool elevation (except for the Stannard Project) and with the outlet works closed. Spillway discharge was computed with the equation $Q=CLH^{3/2}$.

c. Energy dissipators - Energy dissipators were used on all of the phase II projects and consisted of chute blocks and dentated sills which is Hydraulic Jump Basin II according to Bureau of Reclamation standards.

12. REAL ESTATE

a. Acquisition - Real estate acquisition for each project would be as follows:

1. All lands necessary for permanent project structures, such as the dam, spillway, dikes, etc.

2. All lands within and below the maximum flood pool line for the entire reservoir area.

3. Any additional land for recreational uses and not included below the maximum flood pool area, necessary to provide a strip about 300 feet (measured on the horizontal) surrounding the maximum pool level, excepting for areas where local conditions would make such acquisitions undesirable.

4. Any other lands, in the vicinity of the reservoir, deemed desirable for recreation.

5. Lands for all highway and railroad relocations rights-of-way including the dam site access roads. All buildings and other improvements within the maximum pool area would be removed.

b. The determination of lands - Acreage of lands that would have to be acquired were determined from recent topographic maps on which the reservoir area plus the 300-foot strip were outlined. The outlined area was then planimetered.

c. The estimation of per acre land value - To obtain an estimation of the per acre land value, the assessed valuation of a number of properties in and surrounding the reservoir area was taken from tax assessment books. The actual value was obtained by using the proper equalization rates. Knowing the total acreage of these properties, a value per acre could be computed. The value per acre of towns and villages was obtained in the same way but were considered separately. Business establishments and other outstanding parcels which would not give a true average were considered separately.

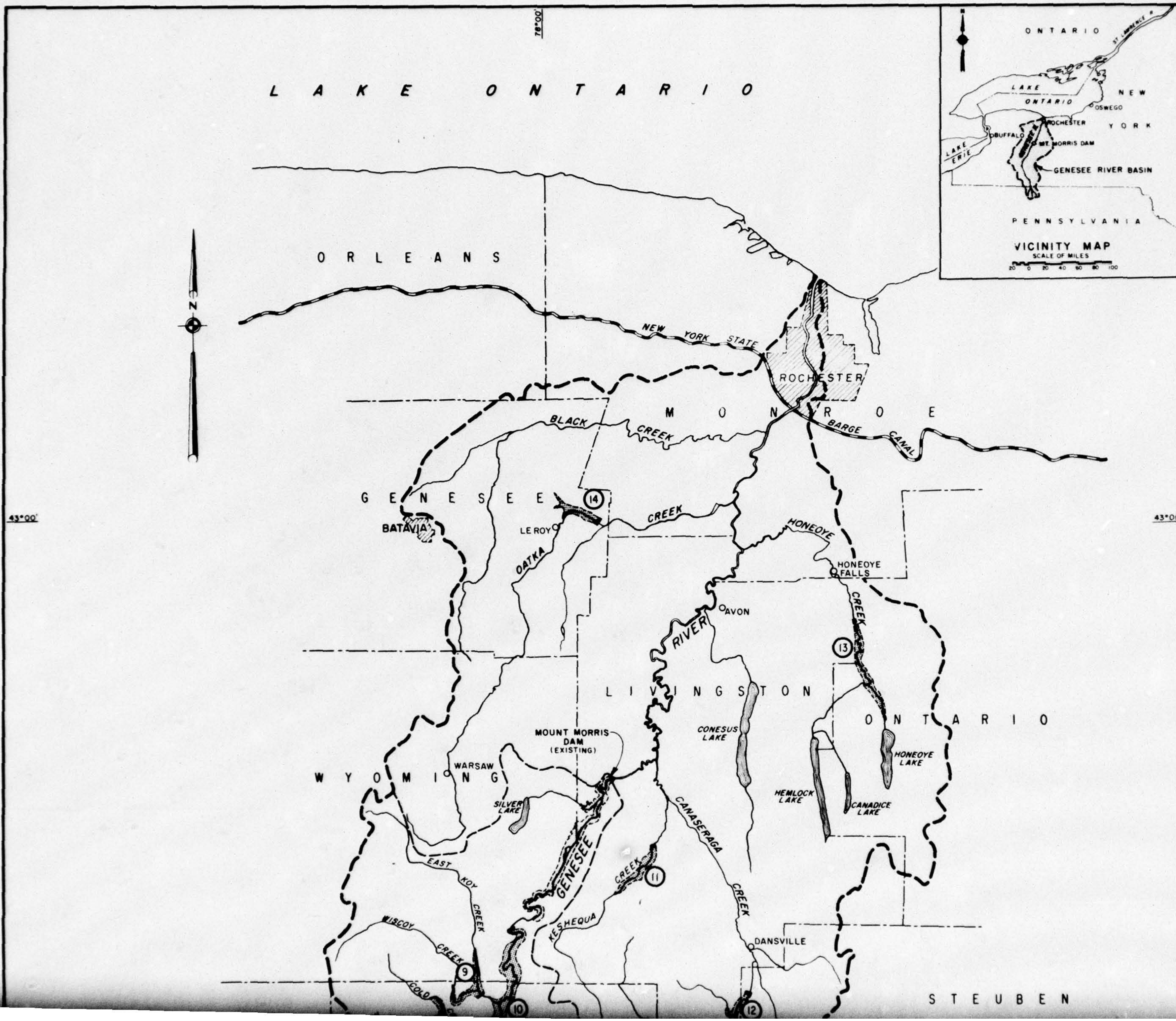
d. Inventory and valuation of buildings - Houses and farm buildings were appraised with an adaption of the Market Data approach described in, "Real Property Appraisers Handbood", published by the U.S. Army Corps of Engineers. Values of property which had been sold recently on the open market were obtained from the town assessors. These parcels were compared with the equalized assessments. The selling prices compared reasonably with the equalized assessments, therefore the assessed values for the buildings were used.

e. Total costs - A count of the parcels of property was made. The total count, multiplied by an estimated acquisition cost of $600 for each parcel gave a value which was totaled with the above real estate costs. To the final value, a 20 percent contingency value was added to give the total costs.

13. ESTIMTATES OF RESERVOIR FIRST COSTS

Estimates of first costs for the reservoirs are based on the assumption that the United States will construct the dam and appurtenant works, acquire the necessary lands and improvements, and make such alterations and relocations of highways and utilities as are necessary for each of the reservoirs. Prices were based on bid prices for similar work with adjustments made for price levels, quantity variance, and availability of materials. Cost estimates for each of phase II projects were based on price levels as follows:

Portage - March 1967 price level
Stannard - May 1967 price level
Belfast - October 1966 price level
Angelica - October 1966 price level


LAKE ONTARIO
ORLEANS
MONROE
GENESEE
LIVINGSTON
ONTARIO
WYOMING
STEUBEN
NEW YORK STATE BARGE CANAL
ROCHESTER
BLACK CREEK
CREEK
OATKA
LE ROY
BATAVIA
HONEOYE
HONEOYE FALLS
CREEK
AVON
RIVER
CONESUS LAKE
HEMLOCK LAKE
CANADICE LAKE
HONEOYE LAKE
MOUNT MORRIS DAM (EXISTING)
WARSAW
SILVER LAKE
GENESEE
CANASERAGA
CREEK
KESHEQUA
CREEK
EAST KOY CREEK
WISCOY CREEK
COLD
DANSVILLE
9
10
11
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13
14
N
78°00'
43°00'
43°00'
ONTARIO
LAKE ONTARIO
NEW YORK
OSWEGO
ROCHESTER
BUFFALO
MT. MORRIS DAM
GENESEE RIVER BASIN
LAKE ERIE
PENNSYLVANIA
VICINITY MAP
SCALE OF MILES
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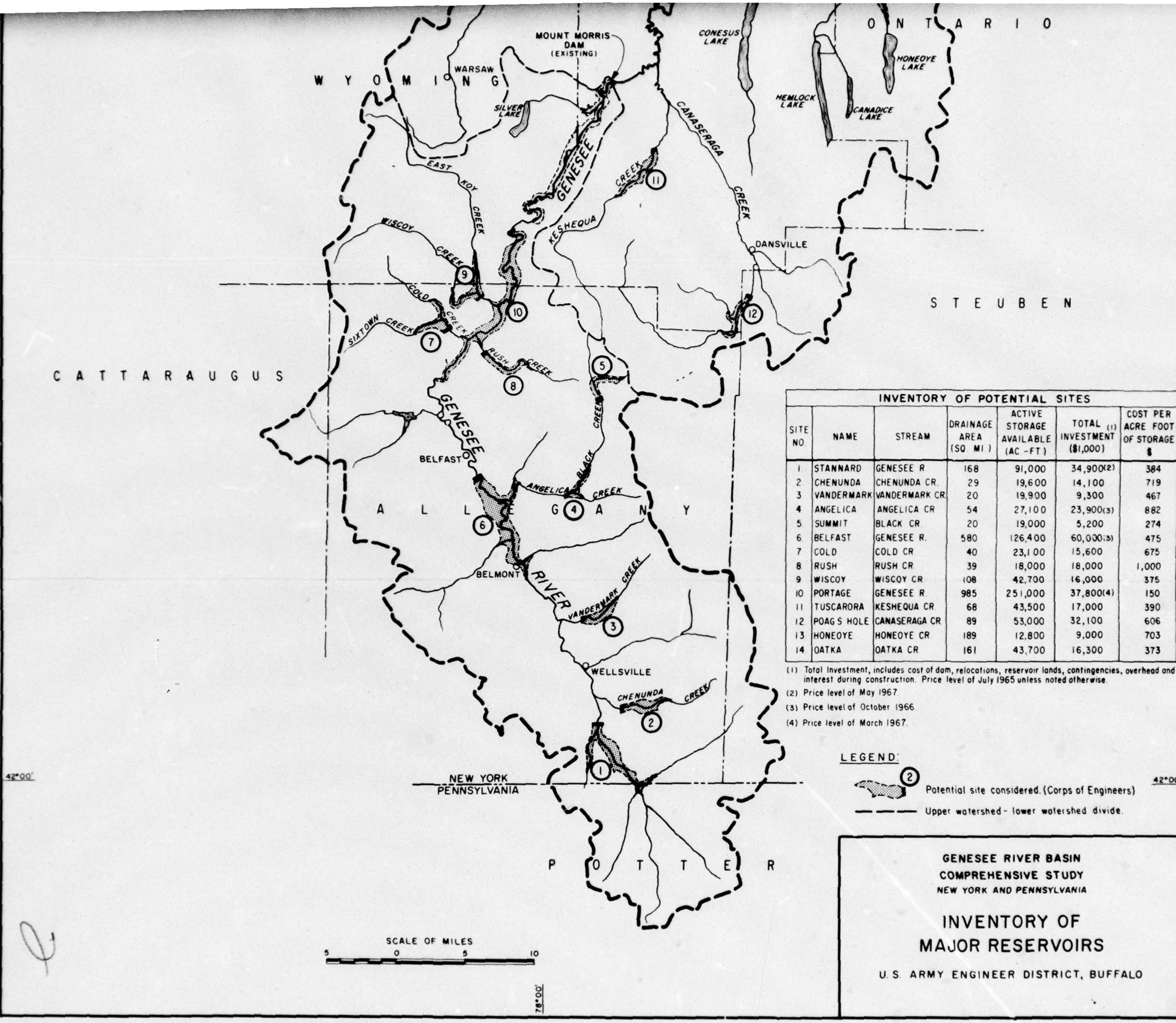


SITE NO	NAME	STREAM	DRAINAGE AREA (SQ MI)	ACTIVE STORAGE AVAILABLE (AC-FT)	TOTAL (1) INVESTMENT ($1,000)	COST PER ACRE FOOT OF STORAGE $
1	STANNARD	GENESEE R	168	91,000	34,900(2)	384
2	CHENUNDA	CHENUNDA CR.	29	19,600	14,100	719
3	VANDERMARK	VANDERMARK CR.	20	19,900	9,300	467
4	ANGELICA	ANGELICA CR	54	27,100	23,900(3)	882
5	SUMMIT	BLACK CR	20	19,000	5,200	274
6	BELFAST	GENESEE R.	580	126,400	60,000(3)	475
7	COLD	COLD CR	40	23,100	15,600	675
8	RUSH	RUSH CR	39	18,000	18,000	1,000
9	WISCOY	WISCOY CR	108	42,700	16,000	375
10	PORTAGE	GENESEE R.	985	251,000	37,800(4)	150
11	TUSCARORA	KESHEQUA CR.	68	43,500	17,000	390
12	POAGS HOLE	CANASERAGA CR	89	53,000	32,100	606
13	HONEOYE	HONEOYE CR.	189	12,800	9,000	703
14	OATKA	OATKA CR	161	43,700	16,300	373

Table title: INVENTORY OF POTENTIAL SITES

(1) Total Investment, includes cost of dam, relocations, reservoir lands, contingencies, overhead and interest during construction. Price level of July 1965 unless noted otherwise.
(2) Price level of May 1967.
(3) Price level of October 1966.
(4) Price level of March 1967.

LEGEND:

(2) Potential site considered. (Corps of Engineers)

Upper watershed - lower watershed divide.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

INVENTORY OF MAJOR RESERVOIRS

U.S. ARMY ENGINEER DISTRICT, BUFFALO

FIGURE C1

FIGURE C1

GENESEE RIVER BASIN COMPREHENSIVE STUDY

APPENDIX C

SECTION II - RESERVOIR PROJECTS - SUPPLEMENTAL DATA

1. GENERAL

There were fourteen major reservoir sites which were investigated by the Corps of Engineers in the phase I or preliminary studies of the Genesee River basin. Four of these reservoir sites were considered for the phase II studies. The supplemental data for these reservoirs are contained in this section. The reservoirs are Portage, Stannard, Belfast and Angelica. Table C2 gives the general data for the four reservoirs of the phase II study. It should be noted that the benefit-cost ratio shown was obtained by using the maximum potential single purpose average annual benefits and that maximum average annual benefits could not be obtained in each category simultaneously. Therefore, the actual benefit-cost ratio in each case would be less than is shown in table C2. Based on the maximum possible benefit-cost ratio the data for only Portage reservoir and Stannard reservoir were developed in survey scope.

TABLE C2 - Preliminary data, Phase II Reservoirs

Site	Stream	D.A. (sq. mi.)	Max. Dam hgt. (ft.)	Storage Cap. (1000 Ac.-Ft.) Total	Active	First Costs ($1000) Dam & Reservoir	Real Estate	Invest-ment	Annual Charges (1): Total ($1000)	$ /Ac. ft.	Potential Average Annual Benefits ($1000) (2) Flood Control	Irri-gation	Power	Water Quality (3)	Outdoor Recrea-tion	Fish & Wildlife	Total	Total Benefit Cost Ratio (4)
Portage	Genesee R.	985	130	283.0	251.0	23,100	5,300	30,919	1,057.0	109	0	0	1,280.0	500.0	818.0	629.0	3,227.0	3.1
Stannard	Genesee R.	168	90	93.5	91.0	17,400	1,250	19,816	706.2	212	17.7	20.1	4.0	494.0	7.8	742.0	1,285.6	1.8
Belfast	Genesee R.	580	110	145.0	127.4	39,800	2,200	44,625	1,538.0	308	4.4	7.2	23.0	500.0	13.3	337.0	884.9	0.6
Angelica	Angelica Ck.	54	130	45.7	39.4	15,100	770	16,574	597.0	362	8.6	7.2	5.0	214.0	86.4	375.5	696.7	1.2

(1) Includes interest and amortization at 3 1/8 percent over 100-year period, engineering and design, supervision and administration, operation and maintenance.

(2) Maximum benefits, net of specific costs, obtained by single-purpose reservoir operations.

(3) Based on meeting portion of flow augmentation required for lower Genesee River below Court Street Dam in Rochester, and with potential benefits limited to cost of alternative waste treatment facilities.

(4) Total potential annual benefits ÷ total annual costs

PORTAGE RESERVOIR

2. LOCATION

The proposed Portage dam site is located on the Genesee River near Portageville, New York, and is approximately 2000 feet downstream from the Route 245 highway bridge. At this point the Genesee River is the boundary between Wyoming County and Livingston County. The reservoir would drain 982 square miles.

3. PERTINENT DATA

RESERVOIR	
1. Maximum W.S. elev. (Spillway design flood pool)	1,196
2. Maximum topography, ft.	1,200
3. Conservation pool, ft.	1,160
4. Flood control pool, ft.	1,190
5. Pool area at maximum W.S., Ac.	7,000
6. Pool area at conservation pool, Ac.	4,100
7. Pool area at flood control pool, Ac.	6,400
8. Channel elev. at toe of dam	1,085
9. Total capacity at flood control pool, Ac. ft.	284,000
10. Total capacity at conservation pool, Ac. ft.	123,000
11. Total capacity at flood control pool, in.	5-1/2
DAM	
12. Top of dam, elev.	1,200
13. Height of dam, ft.	130
14. Length, ft.	745
SPILLWAY	
15. No. of gates	9
16. Size of gates, ft.	48 x 30
17. Top of gates, elev.	1,190
18. Crest elev.	1,160
19. Length (effective), ft.	430
20. Maximum head on crest design (ft)	36
21. Design discharge cfs	310,000
OUTLET WORKS	
22. No. of conduits	9
23. Size of each conduit, $ft.^2$	45
SILLING BASIN	
24. Length ft.	247
25. Bottom Width, ft. (based on assumed pier width)	510
26. Elev. of bottom	1,065
27. Elev. of end sill	1,081

4. INFLOW UNIT HYDROGRAPH

Stream gage and precipitation data were available for the Genesee River at Portageville, New York, Clark's coefficients, Tc and R, obtained from these data were 14.10 and 19.40 respectively. With the computer program 23-J2-L228, unit Hydrographs and Hydrograph Computation, prepared by the Hydraulic Engineering Center and modified in part by the Buffalo District, a 3-hour unit-hydrograph was prepared for the drainage area above the Portage dam site (982 square miles). The peak of the natural unitgraph was 21,452 cfs. For spillway design purposes, the peak of the natural unitgraph was increased 25 percent giving a maximum discharge of 26,820 cfs. Clark's method is described in APPENDIX E of this report. Both the natural and increased unitgraph are shown on figure C4.

5. SPILLWAY DESIGN FLOOD HYDROGRAPH

The spillway design flood hydrograph was obtained by applying the rainfall excess from the maximum probable storm to the increased unit-hydrograph and by routing the resulting discharge through the reservoir spillway. The maximum spillway design discharge is 310,000 cfs. Figure C4 shows the spillway design flood hydrograph. Both the outflow hydrograph and reservoir level curves are those which would result with no particular regulating procedure.

6. HYDRAULIC DESIGN

After consideration of the topography of the Portage reservoir site, it was decided that elevation 1196 feet would be the maximum permissible since a water surface exceeding 1196 feet would adversely affect Houghton, New York, which is to the south. With a conservation pool at elevation 1160, 2-1/2 inches of storage could be maintained for recreation, water supply, water quality and pollution abatement. With 30-foot tainter gates, three inches of storage would be available for flood control at the Portage site. If the Portage reservoir is used in conjunction with the Mt. Morris reservoir, which is downstream, 6 inches of storage would be available for flood control. The regulation between the two reservoirs would depend basically on the multipurpose needs and the time of the year. For instance, during the summer recreation season, flows would be released through to the Mt. Morris Reservoir but in the early spring when the Portage Reservoir could possibly be low because of power drawdown, flows would be stored at Portage. A study of the freeboard of the Mt. Morris Reservoir and other reservoirs in the vicinity indicated that the freeboard on the Portage Reservoir would be adequate. The controlled concrete spillway would be an ogee-shaped weir with a vertical upstream face. Freeboard requirements dictated the maximum water surface allowable for the spillway design flood (1196). With the spillway crest elevation and the height of gates known, the spillway crest length was determined by trial. The spillway design flood was routed through a range of spillway lengths to determine the minimum length that would pass the spillway design flood without exceeding the maximum pool elevation of 1196. The net length was determined to be 430 feet. The water surface before routing was assumed to be at elevation 1190 which is full pool elevation. The stilling basin was designed in accordance with the hydraulic design criteria set forth in EM1110-2-1603, "Hydraulic Design of Spillways", Corps of Engineers.

The maximum design flood pool elevation was used in determining the D1, D2, depths. Tailwater elevations were obtained from a conveyance curve which was based on a cross section located downstream from the dam site and was taken from a U.S.G.S. topographic map. The apron slab would be 510 feet wide by 247 feet long. The apron slab elevation was dictated by the elevation of firm rock. At the Portage site rock was at elevation 1065. With this slab elevation, the D2 depth was sufficient to meet the tailwater depth. The end sill would be 16 feet high. The outlet works would have a cross-sectional area of 400 square feet which would insure a flow of 12,000 cfs at conservation pool level. This flow is the maximum which can be tolerated downstream from the Mt. Morris Reservoir.

7. With the reservoir at elevation 1196, a large portion of the village of Fillmore would be inundated. Studies showed that a levee around the village would be as economical as acquisition of the properties which would be inundated. Under these circumstances the levee would be desirable. A total of 10,000 linear feet of levee would be required including 3,800 feet of tie-back levee at Cold Creek. Stop-log structures would be necessary at the crossing of Route 19 over Cold Creek. The top of the levee would be at elevation 1200. A 36-inch and a 60-inch culvert would accommodate internal drainage behind the levee.

8. GEOLOGY

As a result of glacial drift blockades in the former (preglacial) valley, the Genesee River was diverted to its present path at the proposed site for the Portage dam. The river valley changes from a broad open valley (upstream of site) to a narrow, steep canyon (at and downstream of site). The river has cut into Devonian sandstones and shales and drops rapidly over a distance of 3 miles from an elevation of about 1077 feet to about 760 feet above sea level and forms three cataracts.

9. The rock formations in the area dip gently to the south about 40 feet per mile. No major structural disturbances are known to exist in the vicinity of the proposed site; however, numerous small "broken" anticlines are reported by Neel*

*Neel, R.S., 1951, Stratigraphy and Glacial Geology of the Portage Quadrangle, Master's Thesis, University of Rochester, 1951, 102p.

(1951,p.90) to be exposed in stream beds in the Portage quadrangle. He also observed a small thrust fault (8 foot displacement) downstream of the proposed site. Neel measured numerous sets of joints throughout the area. He observed a dominant direction between N40°W and N50°W and a minor direction between N40°E and N50°E. The structures described by Neel were not observed in the field by District personnel because of limited funds available for geologic studies. The rock formation present at the proposed site is Nunda Sandstone (Upper Devonian) which forms a steep bluff on the left abutment. Underlying the Nunda is the Gardeau Shale.

10. SUBSURFACE INVESTIGATIONS

At the Portage site, (3)NX Core borings were drilled by the Mobil District for the Buffalo District during May and June 1966. The borings are located along the proposed dam axis and are shown on figure C4.

11. OVERBURDEN MATERIALS

At the left abutment, the overburden consists of about 10 feet of sand and gravel overlying bedrock. On the bluff adjacent to the right abutment, the overburden reaches depths of about 95 feet and consists of clay and sandy and gravelly clay with occasional cobbles and boulders.

12. FOUNDATION CONDITIONS

The proposed dam would be supported by hard, massive, fine-grained, moderately jointed, micaceous, bluish-gray sandstone and thinly bedded, moderately hard, calcareous, dark gray shales. Initial core borings indicate that the top of sound rock is about 15 to 30 feet below the ground surface on the left abutment and about 30 feetbelow on the right abutment.

13. LEAKAGE CONDITIONS

Significant losses of water during drilling operations indicated that a thorough grouting program would be required in the abutments and valley sections to seal the open joints.

14. CONSTRUCTION MATERIALS

Coarse aggregate can be obtained from quarries located at Le Roy, Stafford, Akron and Buffalo, New York. The distances of these quarries from the proposed damsite range from 30 to 60 miles.

Fine aggregate is available at Mt. Morris, Pavilion and Newstead. The distances of these pits from the proposed site are 17, 26 and 50 miles respectively.

15. DESIGN DETAILS

Since the valley at the Portage site is relatively narrow and since firm rock is near the surface, the dam proposed for the site would be a concrete gravity type structure. The structure would be 745 feet long and would rise 110 feet above the valley floor. The spillway would be regulated by 9 radial gates which would be 30 feet high and 48 feet long and would be supported by 8 piers, 10 feet wide. The stilling basin would be founded on rock. Power facilities at the Portage site are described in APPENDIX L of this report. The outlet works would consist of 9 conduits each controlled by two slide gates. One gate would be in reserve for emergency closure.

16. RELOCATIONS

The reservoir would necessitate the relocation of the following:

- 5 miles of 115KV transmission line
- 2.5 miles of 34.5KV transmission line
- 9.2 miles of 14-inch high pressure gasline
- 18.4 miles of 20-inch high pressure gasline
- Rossburg measuring station **(Consolidated Gas Supply Corp. metering station)**
- 10 unit motel at Fillmore
- 12.3 miles of heavy duty road
- 2800 square-foot bridge over Wiscoy Creek
- 1.8 miles of medium duty road
- 3 cemeteries (765 graves)
- 7200 square-foot bridge over Genesee River

Relocations are shown on figure C3.

17. LAND REQUIREMENTS

Estimated land requirements for the reservoir up to 1200 elevation would be 7400 acres including the village of Portageville, Wiscoy and Rossburg, New York. Lands in Fillmore, New York, which would be in the flooded area would be protected by a levee. The following lands would be required for recreational purposes:

300-foot strip on east side of reservoir	545 ac.
(3) 500 acre sites	1500 ac.
(1) 50 acre site	50 ac.

At the time of the 1966 survey the reservoir would also require the acquisition and removal of the buildings shown in table C3. Real estate first costs are shown in table C2.

TABLE C3 - Buildings to be acquired for the Portage Reservoir

Township or Village	Equalization Rate	Residences No.	Residences Assessed Valuation $	Farm Units No.	Farm Units Assessed Valuation $	Commercial No.	Commercial Assessed Valuation $
Township of Genesee Falls	.38	2	7,200	4	8,700	1	15,400
Township of Portage	.35	-	---	-	---	15	35,200
Township of Hume	.43	11	20,800	38	108,600	-	---
Township of Caneadea	.37	1	4,300	6	17,000	1	1,900
Township of Granger	.47	2	1,350	6	6,100	-	---
Village of Portageville	.38	83	135,800	3	5,200	13	47,200
Village of Fillmore	.43	6	15,100	-	---	-	---
Village of Wiscoy	.43	30	96,800	5	21,500	4	33,500
Village of Rossburg	.43	10	32,200	-	---	4	16,340

18. CONCLUSIONS

The Portage site is recommended as part of the basin development plans. Factors which contribute to the recommendation include a large volume of storage at a relatively low cost, hydroelectric power which could be developed and when used in conjunction with the Mt. Morris Reservoir, 6 inches of storage would be available for flood control. The proximity of the Portage site to Letchworth Park greatly enhances the recreational possibilities of each site.

19. COST ESTIMATES

Totals of the following cost estimates were used to obtain dam and reservoir, real estate and investment first cost but the breakdown of the cost estimates is shown for informational purposes only.

REASONABLE CONTRACT ESTIMATE

SHEET 1 OF 4

PROJECT PORTAGE RESERVOIR - 5½" STORAGE
GENESEE RIVER BASIN, NEW YORK

Survey Report
March 1967

INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	TOTAL ESTIMATED FIRST COSTS				
	Concrete Dam				$19,400,000
	Levee Around Fillmore, N. Y.				1,500,000
	Relocations				11,900,000
	TOTAL ESTIMATED FIRST COST				$32,800,000
	OPERATION & MAINTENANCE				
	Concrete Dam				$55,000
	Levee Around Fillmore, N. Y.				1,000
	Relocations				- ---
	OPERATIONS & MAINTENANCE COSTS				$56,000

REASONABLE CONTRACT ESTIMATE

SHEET 2 OF 4

PROJECT: PORTAGE RESERVOIR - 5½" STORAGE
GENESEE RIVER BASIN, NEW YORK

Survey Report
March 1967

INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	CONCRETE DAM				
	Elevations				
	Top 1200				
	Spillway Crest 1160				
	Storage W/Gates 5½"				
1	Clearing	1,000	Acre	$ 250.00	$ 250,000
2	Cofferdams & Care of Water		L.S.		500,000
3	Excavation-Common	302,000	C.Y.	1.50	453,000
4	Excavation-Rock	302,000	C.Y.	5.00	1,510,000
5	Rock Fill	50,000	C.Y.	3.00	150,000
6	Mass Concrete-Spillway Weir, Abutments, Training Walls & Wing Walls	276,000	C.Y.	19.50	5,382,000
7	Concrete-Stilling Basin & End Sill	20,900	C.Y.	24.50	512,050
8	Concrete-Gate Piers	8,100	C.Y.	39.00	315,900
9	Portland Cement	316,000	BBL.	5.00	1,530,000
10	Steel-Reinforcement	1,740,000	LB	0.14	243,600
11	Taimter Gate W/Embedded Metal & Machinery	9	EA.	175,000	1,575,000
12	Tainter Gates Machinery Housing		L.S.		50,000
13	Side Gate & Accessories	9	EA.	60,000	540,000
14	Conduit Lining	9	EA.	6,500	58,500
15	Control Structure		L.S.		50,000
16	Electrical Work		L.S.		100,000
17	Miscellaneous Items		L.S.		400,000
	TOTAL ESTIMATED CONTRACTORS EARNINGS - CONCRETE DAM				$13,670,050
	Contingencies				2,769,950
	TOTAL ESTIMATED CONTRACTORS EARNINGS PLUS CONTINGENCIES				$16,440,000
	Engineering & Design				1,800,000
	Supervision & Administration				1,160,000
	TOTAL ESTIMATED FIRST COST-CONCRETE DAM				$19,400,000
	OPERATION & MAINTENANCE				
	Operation			$ 40,000	
	Maintenance			15,000	
	TOTAL O & M				$ 55,000

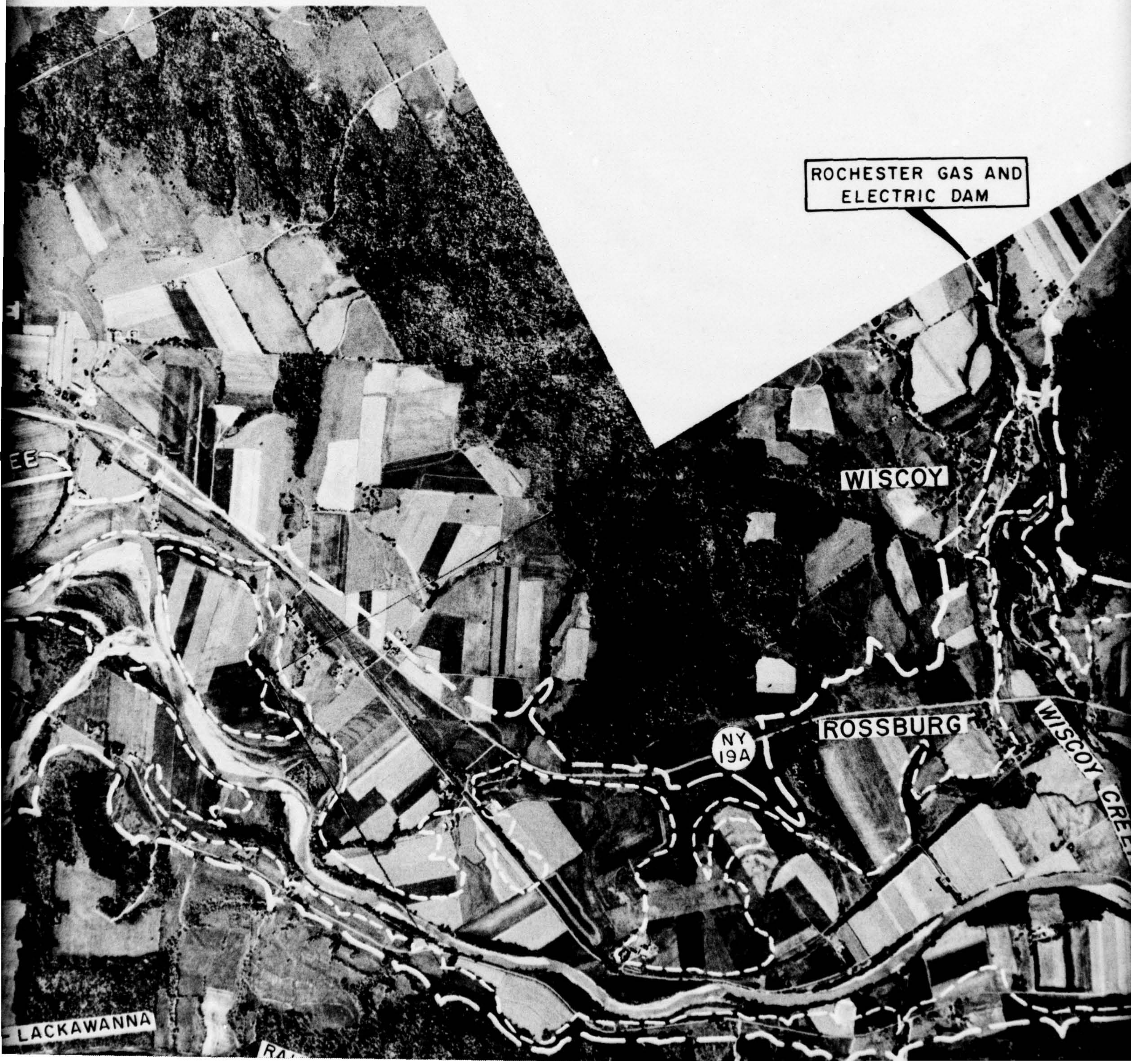
REASONABLE CONTRACT ESTIMATE					SHEET 3 OF 4
PROJECT PORTAGE RESERVOIR - 5½" STORAGE GENESEE RIVER BASIN, NEW YORK	Survey Report March 1967				INVITATION NO.
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	LEVEE AROUND FILLMORE, N. Y.				
1	Clearing		L.S.		$ 2,000
2	Stripping	47,000	C.Y.	0.75	35,250
3	Borrow Excavation	750,000	C.Y.	0.75	562,500
4	Compacted Embankment	650,000	C.Y.	0.35	227,500
5	Seeding	32	Acre	400.00	12,800
6	Closure Structures	4	EA.	37,000.00	148,000
7	Move Motel (10 Units)		L.S.		20,000
8	Internal Drainage Structures		L.S.		40,000
	Contractor's Earnings				1,048,050
	Contingencies				221,950
	Contractor's Earnings & Cont.				1,270,000
	Engineering & Design				140,000
	Supervision & Admin.				90,000
	TOTAL ESTIMATED FIRST COST LEVEE AROUND FILLMORE, N. Y.				$ 1,500,000
	ANNUAL MAINTENANCE				$ 1,000

REASONABLE CONTRACT ESTIMATE					SHEET 4 OF 4
PROJECT	PORTAGE RESERVOIR - 5½" STORAGE GENESEE RIVER BASIN, NEW YORK Survey Report March 1967				INVITATION NO.
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	<u>RELOCATIONS</u>				
	<u>HIGHWAYS</u>				
	Relocate 9.66 miles of N.Y.S. Rt. 19A-Portageville, N.Y. to Fillmore N.Y. Relocate 1.59 Miles of N.Y.S. Rt. 19 from Fillmore South				$ 4,170,000
	Relocate N.Y.S. Rt. 245 over considered dam to N.Y.S. Rt. 19A				650,000
	Relocate a Portion of Snyder Road over a part of Ballard Road & Connect. with N.Y.S. Rt. 19 W/Bridge over Genesee River				540,000
	TOTAL ESTIMATED CONTRACTOR'S EARNINGS-HIGHWAYS				$ 5,360,000
	<u>UTILITIES</u>				
	Relocate H.P. Gas & Electric Transmission Lines				$ 3,260,000
	TOTAL ESTIMATED CONTRACTOR'S EARNINGS-UTILITIES				$ 3,260,000
	TOTAL ESTIMATED CONTRACTOR'S EARNINGS-RELOCATIONS				$ 8,620,000
	CONTINGENCIES				1,700,000
	TOTAL EST. CONTRACTOR'S EARNINGS PLUS CONTINGENCIES				$10,320,000
	ENGINEERING & DESIGN				950,000
	SUPERVISION & ADMINISTRATION				630,000
	TOTAL ESTIMATED FIRST COST-RELOCATIONS				$11,900,000
	ANNUAL MAINTENANCE				---------

SCALE: 1"= 1667' (APPROX.)
PHOTOGRAPHY: JULY 1963 AND
SEPTEMBER 1964


NY 19
COLD CREEK
FILLMORE
LEVEE
LEVEE
NY 19
RUSH CREEK
ERIE-LACKAWANNA

2


ROCHESTER GAS AND
ELECTRIC DAM
WISCOY
NY
19A
ROSSBURG
WISCOY CREEK
LACKAWANNA


AS AND
DAM
BLUESTON
QUARRY
WYOMING CO.
ALLEGANY CO.
Gas
Pipelines
NY
19A
Flow
WISCOY CREEK
RIVER
GENESEE

NY 19A
DAM
PORTAGEVILLE
BLUESTONE QUARRY
CONSERVATION POOL
Flow
SPILLWAY DESIGN POOL
ERIE-LACKAW

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

PORTAGE RESERVOIR

U S ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

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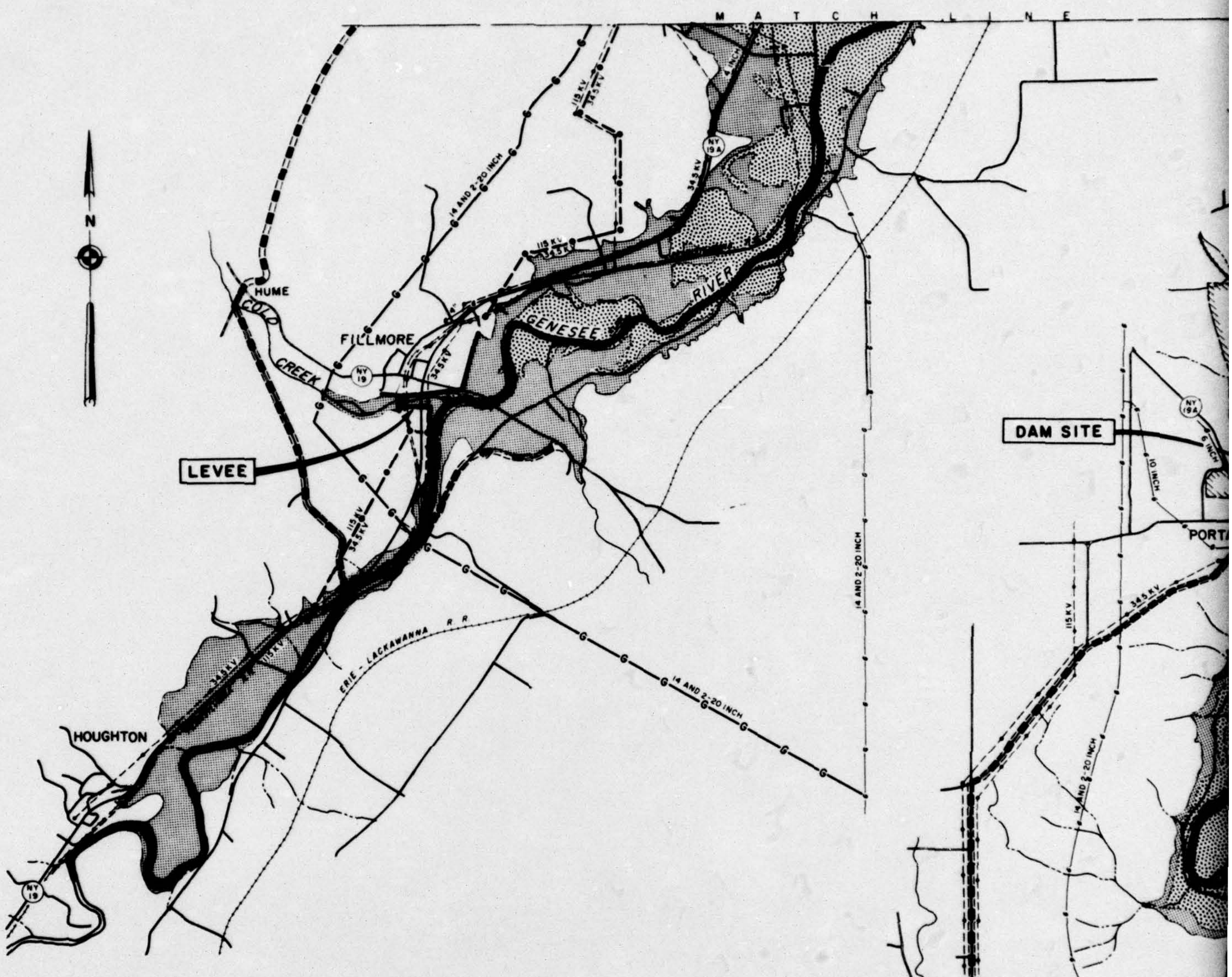
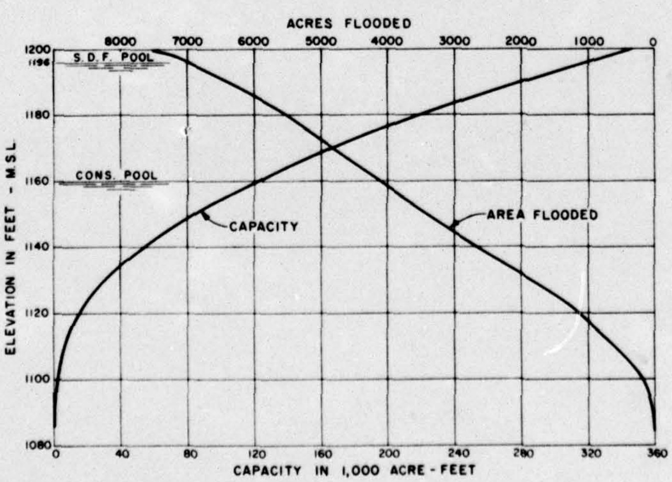
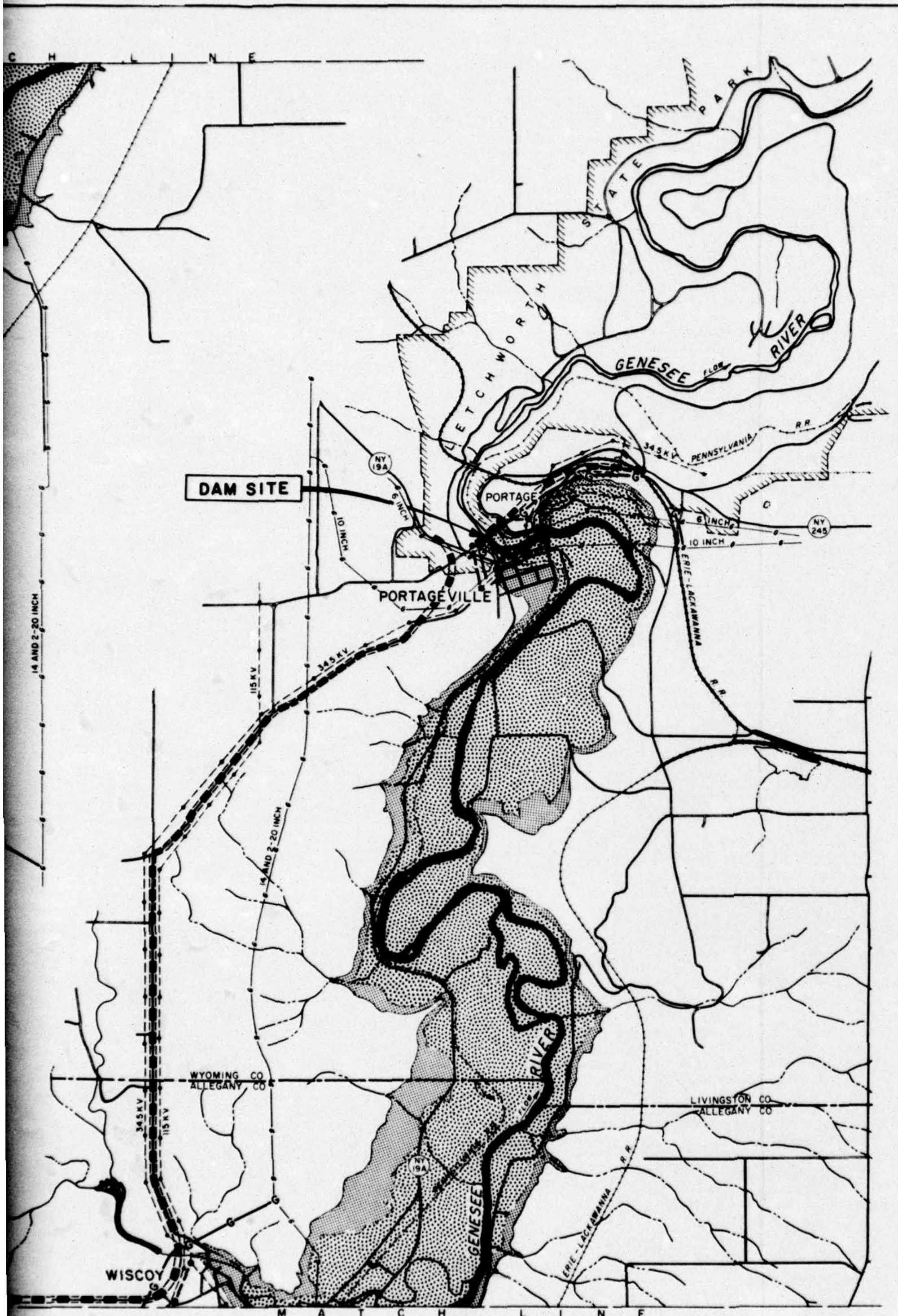
FIGURE C2



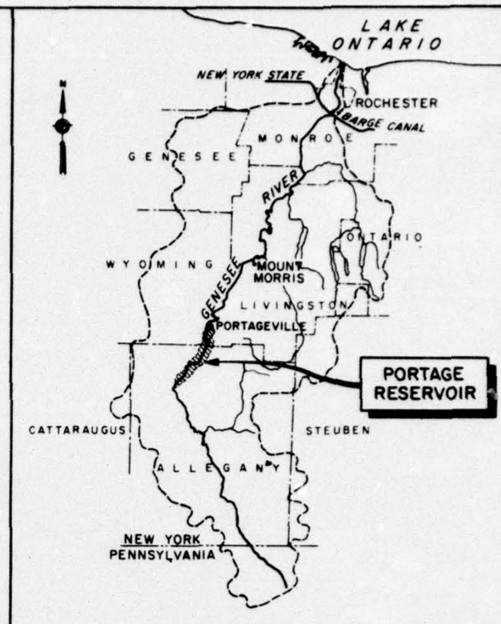


RESERVOIR AREA AND CAPACITY CURVES



RESERVOIR MAP

2000 0 2000 4000
SCALE OF FEET



LOCATION MAP

SCALE IN MILES
3 0 3 6 9

LEGEND:

- SPILLWAY DESIGN FLOOD POOL EL. 1196
- MAXIMUM CONSERVATION POOL EL. 1160
- HEAVY DUTY ROAD
- MEDIUM DUTY ROAD
- LIGHT DUTY ROAD
- UNIMPROVED DIRT ROAD
- RAILROAD
- RAILROAD, DISMANTLED
- POWER LINE
- NATURAL GAS PIPELINE
- PROPOSED RELOCATED HEAVY DUTY ROAD
- PROPOSED RELOCATED MEDIUM DUTY ROAD
- PROPOSED RELOCATED POWER LINE
- PROPOSED RELOCATED NATURAL GAS PIPELINE
- EXISTING STREAM

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

PORTAGE DAM AND RESERVOIR

CORPS OF ENGINEERS, BUFFALO DISTRICT

JUNE 1967

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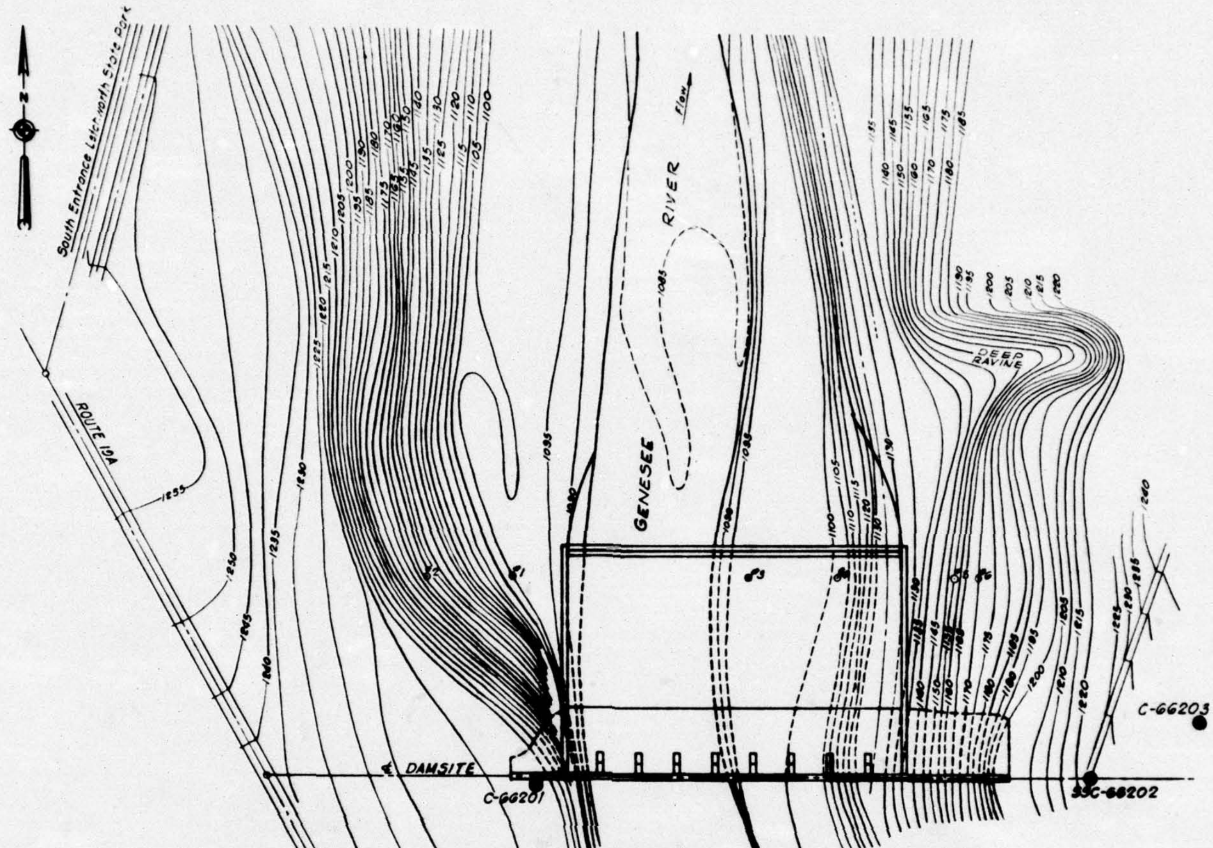
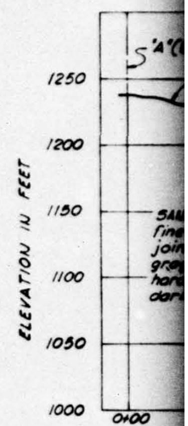
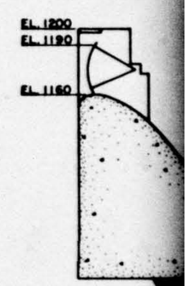
FIGURE C3

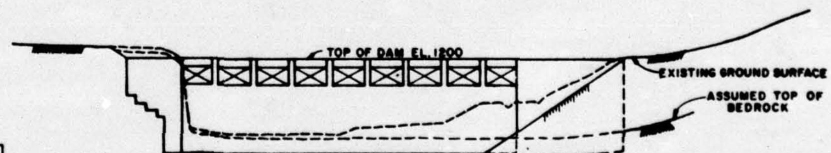


PLAN

SCALE OF FEET

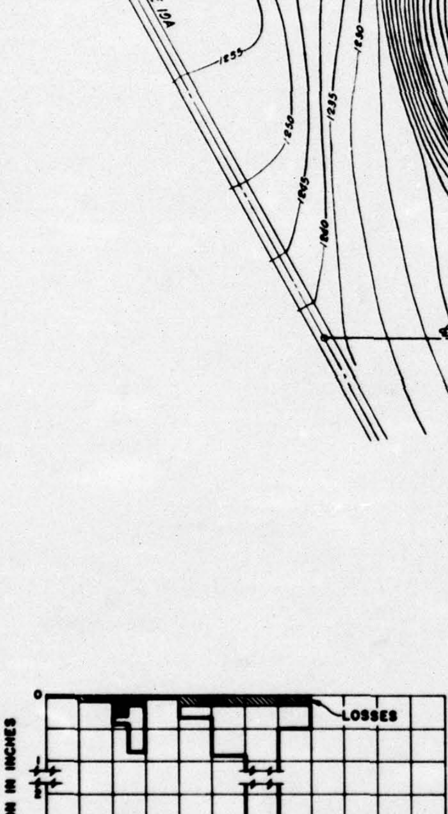
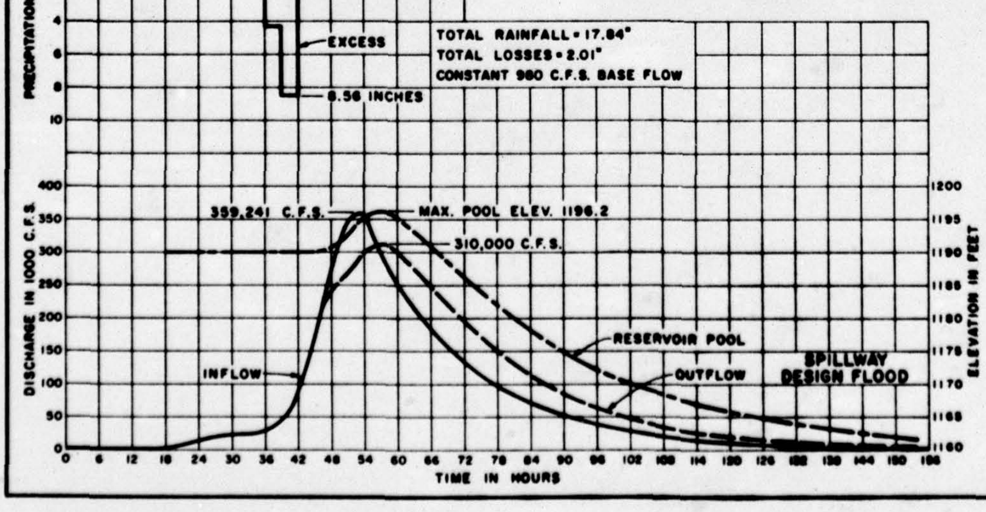


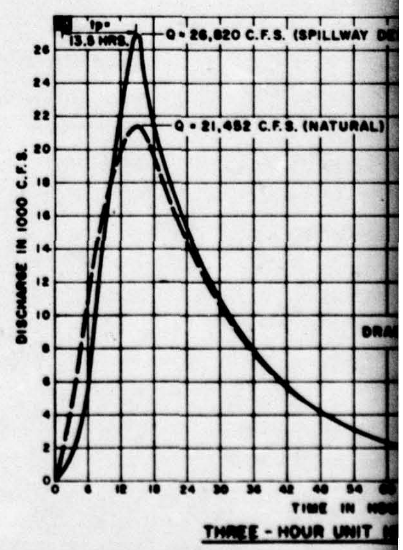




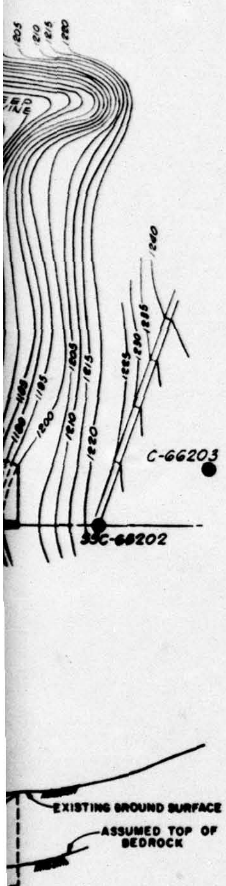
UPSTREAM ELEVATION

SCALE OF FEET

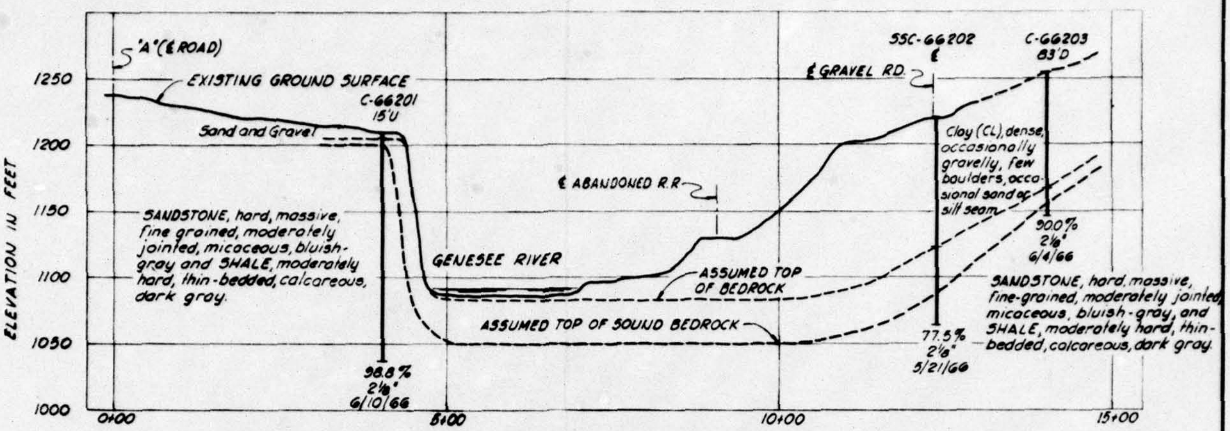





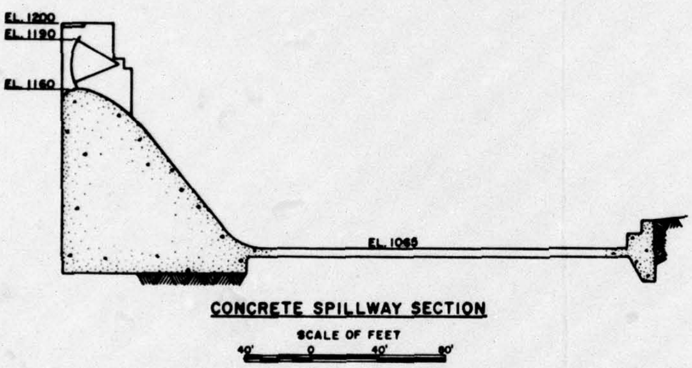
THREE - HOUR UNIT



VERTICAL SCALE EXAGGERATED



GEOLOGIC PROFILE AT DAMSITE



CONCRETE SPILLWAY SECTION

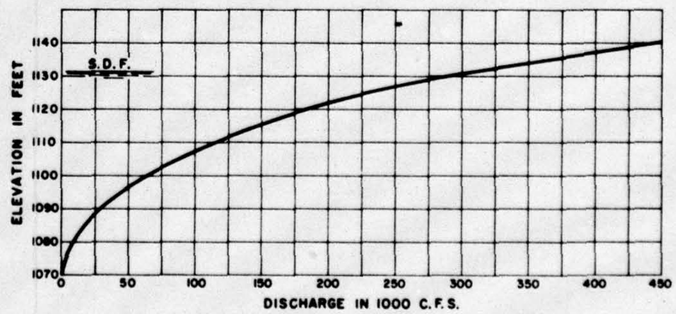
LEGEND FOR EXPLORATIONS:

HOLE NUMBER AND DESIGNATION → C-66302
*OFFSET → ℄
TOP OF HOLE →
ASSUMED TOP OF BEDROCK →
BOTTOM OF HOLE →
PERCENT CORE RECOVERED IN BEDROCK → 94.3%
DIAMETER OF BEDROCK CORE → 2 1/8"
DATE EXPLORATION COMPLETED → 6/2/66

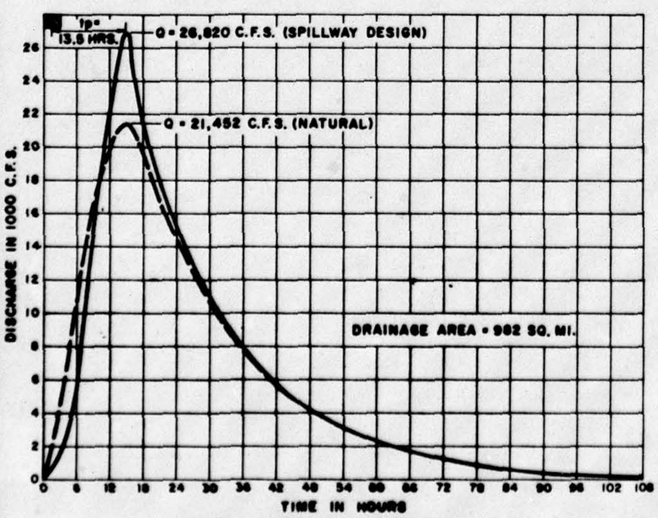
*OFFSET FROM PROFILE OR SECTION MAY BE UPSTREAM OR DOWNSTREAM (U OR D) AS DEFINED.

TYPE OF EXPLORATION CODE DESIGNATION

C	CORE HOLE
AR	AUGER AND/OR ROCKBIT HOLE
SS	SPLIT SPOON SAMPLE
●	VERTICAL EXPLORATION



TAILWATER STAGE DISCHARGE CURVE



THREE - HOUR UNIT HYDROGRAPHS

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

PORTAGE DAM
PLAN AND DETAILS

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE C4

STANNARD RESERVOIR

20. LOCATION

The Stannard dam site is located on the Genesee River in Allegany County, New York, approximately 2 miles upstream from Stannards Corners, New York. An area of 168 square miles would be drained by the reservoir.

21 PERTINENT DATA

RESERVOIR	
1. Maximum W.S.elev. (Spillway design flood pool)	1625.5
2. Maximum topography, ft.	1630
3. Conservation pool, ft.	1593
4. Flood control pool, ft.	1620
5. Pool area at maximum W.S., Ac.	2440
6. Pool area at conservation pool, Ac.	1550
7. Pool area at flood control pool Ac.	2330
8. Channel elev. at toe of dam	1531
9. Total capacity at flood control pool, Ac. ft.	93,500
10. Total capacity at conservation pool, Ac. ft.	39,500
11. Total capacity at flood control pool, in.	10-1/2
DAM	
12. Top of dam, elev.	1630
13. Top width, ft.	20
14. Height of dam, ft.	90
15. Length, ft.	2300
SPILLWAY	
16. No. of gates	4
17. Size of gates, ft.	47.5 x 27
18. Top of gates, ft.	1620
19. Crest elev.	1593
20. Length (effective), ft.	190
21. Maximum head on crest (design), ft.	32
22. Design discharge cfs	116,000
OUTLET WORKS	
23. No. of conduits	5
24. Size of each conduit, $ft.^2$	48

STILLING BASIN

25.	Length, ft.	185
26.	Bottom Width, ft. (based on assumed pier width)	220
27.	Elev. of bottom	1512
28.	Elev. of end sill	1522

22. INFLOW UNIT HYDROGRAPHS

Concurrent stream gage and precipitation data were not available for the Stannard site, therefore a synthetic unit-hydrograph was derived for this area utilizing Clark's Method. Clark's Coefficients Tc and R were obtained from a generalized set of curves of (Tc+R) and R versus drainage area. These curves are shown in APPENDIX E of this report. For the Stannards drainage area the coefficients Tc and R are 6.50 and 5.30 respectively. The resulting 3-hour unitgraph for natural conditions had a maximum discharge of 10,405 cfs. For spillway design purposes, the peak of the natural unitgraph was increased 25 percent giving a maximum discharge of 13,000 cfs. Clark's Method is described in APPENDIX E of this report. Both the natural and the increased unitgraphs are shown on figure C7.

23. SPILLWAY DESIGN FLOOD HYDROGRAPH

The spillway design flood hydrograph was obtained by applying the rainfall excess from the maximum probable storm to the increased unit-hydrograph and by routing the resulting discharge through the reservoir spillway. The maximum spillway design discharge is 116,000 cfs. Figure C7 shows the spillway design flood hydrograph. Both the outflow hydrograph and reservoir level curves are those which would result with no particular regulating procedure.

24. HYDRAULIC DESIGN

After consideration of the topography of the Stannard reservoir site, it was decided that elevation 1625.5 feet would be the maximum permissible. With a conservation pool at elevation 1593, 4-1/2 inches of storage could be maintained for recreation, water supply, water quality and pollution abatement with 27-foot tainter gates, 6 inches of storage would be available for flood control. A study of the freeboard of the Mt. Morris Reservoir and other reservoirs in the vicinity indicated that the freeboard on the Stannard Reservoir would be

adequate. The controlled concrete spillway would be an ogee-shaped weir with a vertical upstream face. Freeboard requirements dictated the maximum water surface allowable for the spillway design flood (1625.5). With the spillway crest elevation and the height of gates known, the spillway crest length was determined by trial. The spillway design flood was routed through a range of spillway lengths to determine the minimum length that would pass the spillway design flood without exceeding the maximum pool elevation of 1625.5. The net length was determined to be 190 feet. With the lower height of dam and relatively smaller volume of storage it seemed reasonable to use the maximum probable flood with a starting pool elevation at less than full pool elevation. The lowering of the pool could be accomplished by outlet flow and adequate flood warning. A starting pool elevation of 1605 was used for the routing procedure. The stilling basin was designed in accordance with the hydraulic design criteria set forth in EM1110-2-1603, "Hydraulic Design of Spillways", Corps of Engineers. The maximum design flood pool elevation and discharge were used in determining the D1, D2 depths. Tailwater elevations were obtained from a conveyance curve which was based on a cross-section downstream from the dam site which was taken from a U.S.G.S. topographic map. The apron slab would be 220 feet wide by 185 feet long. The apron slab elevation was obtained by a direct solution method described in "Hydraulic Energy Dissipators", by Elevatorski. The slab elevation was determined to be 1512. The end sill would be 10 feet high. The outlet works would have a cross-sectional area of 240 square feet which would allow a flow of 10,000 cfs under conservation pool conditions. This capacity would insure the downstream zero damage flow of 4000 cfs at a lesser head and also allow a reasonable draining time.

25. SUBSURFACE INVESTIGATIONS

At the Stannards site (2)NX Core borings and (1)NX rockbit boring were drilled by the Mobile District for the Buffalo District in June 1966. The borings are located along or adjacent to the proposed dam axis and are shown on figure C7.

26. OVERBURDEN MATERIALS

On the left abutment, the overburden is approximately 60 to 70 feet in depth. On the right abutment the overburden was penetrated about 100 feet without contacting rock. The soil materials consist of gravelly clays, underlain with stratified, thick bedded clay and silt.

27. FOUNDATION CONDITIONS

The initial drilling indicates that the left abutment is the most suitable location for the concrete spillway structure founded on rock. The proposed structure would be supported by hard, massive, fine-grained, gray sandstone and slightly soft to moderately hard, thin-bedded, slightly jointed dark gray shale. The borings indicate that sound rock is from 74 to 78 feet below the ground surface in the vicinity of the proposed structure.

28. LEAKAGE CONDITIONS

Moderate water losses during drilling indicate that grouting would be required in the left abutment for the structure.

29. SOURCES OF CONSTRUCTION MATERIALS

Random and impervious fill is available in the general vicinity of the site as well as run of bank gravel. It is believed that riprap is available from quarries in the general vicinity. In the past, a quarry at Jasper, New York has been approved as a source of riprap. Sources of concrete aggregates are Stafford, Le Roy, Rochester and Buffalo. A quarry at State College, Pennsylvania, which supplied aggregates for Allegheny Dam is also a potential source of materials.

30. DESIGN DETAILS

The proposed rolled earth riprap protected embankment would have a length of 2300 feet and would rise about 90 feet above the valley floor. The crown width at top elevation of 1630 would be 20 feet. The reinforced concrete spillway would be founded on rock at the left abutment. The spillway would be regulated by four radial gates which would be 47.5 feet long by 27 feet high and would be supported by 3 piers, 10 feet wide. The stilling basin would be founded on rock. The outlet works would consist of 5 conduits, each controlled by two slide gates. One gate would be in reserve for emergency closure.

31. To prevent overflow through the Marsh Creek Valley, it would be necessary to construct a dike approximately 2.7 miles upstream from the confluence of Marsh Creek and the Genesee River. The dike would be approximately 1600 feet long with a top width of 10 feet at a crest elevation of 1630. Slopes would be IV on 2.5H. An impervious blanket would be provided to control seepage.

32. RELOCATIONS

The reservoir would necessitate the relocation of the following:

3.1 miles of 14-inch high pressure gasline
3.1 miles of 20-inch high pressure gasline
1.2 miles of 6-inch high pressure gasline
4.3 miles of 4800 V transmission lines
4.7 miles of heavy duty road
4.5 miles of medium duty road
8 miles of railroad
2 cemeteries (450 graves)

Relocations are shown on figure C6.

33. LAND REQUIREMENTS

Estimated land requirements for the reservoir up to elevation 1625 would be 2440 acres which are assumed to include a 300-foot strip around the reservoir for recreation purposes. Additional lands for recreation would include a 500-acre site and a 50-acre site. At the time of the 1966 survey, the reservoir would require the acquisition of the following buildings:

32 residences, total assessed value = $88,300
33 farm units, total assessed value = 53,400
6 commercial, total assessed value = 28,500

The equalization rate for the Township of Willing is 0.42. Real estate first costs are shown in table C2.

34. CONCLUSIONS

The Stannards site was not included in the basin development plans because of its unfavorable benefit-cost ratio. The high cost of relocations, relatively small amount of flood benefits and no possibilities for power development were the major reasons for its low benefit-cost ratio.

35. COST ESTIMATES

Totals of the following cost estimates were used to obtain dam and reservoir, real estate and investment first costs but the breakdown of the cost estimates is shown for informational purposes only.

REASONABLE CONTRACT ESTIMATE

SHEET 1 OF 3

PROJECT: STANNARD RESERVOIR
GENESEE RIVER BASIN, N. Y.

Survey Report
May 1967

INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	Concrete & Earthfill Dam				
	Elevations:				
	Top 1630				
	Spillway Crest 1593				
	Top of Gates 1620				
1	Cofferdam & Care of Water		L.S.		$ 425,000
2	Excavation - Borrow	725,000	C.Y.	0.55	398,750
3	Excavation - Common	975,000	C.Y.	0.70	682,500
4	Excavation - Stripping	108,000	C.Y.	0.90	97,200
5	Excavation - Trench	27,000	C.Y.	1.25	33,750
6	Excavation - Rock	175,000	C.Y.	6.00	1,050,000
7	Embankment - Compacted	1,127,000	C.Y.	0.20	225,400
8	Rock Fill	153,500	C.Y.	3.00	460,500
9	Filter Material	26,000	C.Y.	1.50	39,000
10	5' Blanket	135,000	C.Y.	0.20	27,000
11	Mass Concrete: Spillway Weir, Right Training Wall, Non-Overflow Sect.	187,800	C.Y.	21.00	3,943,800
12	Concrete - Stilling Basin	8,150	C.Y.	30.00	244,500
13	Concrete - Gate Piers	3,140	C.Y.	46.00	144,440
14	Concrete - Left Upper Training Wall	2,240	C.Y.	42.00	94,080
15	Concrete Facing	17,500	S.F.	14.00	245,000
16	Portland Cement	211,000	BBL.	5.00	1,055,000
17	Steel Reinforcement	1,065,000	LB.	0.14	149,100
18	Tainter Gates w/embedded Metal & Machinery	4	EA.	155,000	620,000
19	Tainter Gate Machinery Housing		L.S.		20,000
20	Slide Gates & Accessories	5	EA.	80,000	400,000
21	Conduit Lining	5	EA.	7,500	37,500
22	Control Structure		L.S.		35,000
23	Electrical Work		L.S.		70,000
24	Service Bridge		L.S.		57,000
25	Steel Guard Railing	3,900	L.F.	3.50	13,650
26	Misc. Items		L.S.		275,000
27	Clearing Reservoir	400	Acre	250	100,000
	Total Est. Contractor's Earnings				$ 10,943,170
	Contingencies				2,188,830
	Total Contractors Earnings Plus Cont.				$ 13,132,000
	Engineering & Design				1,440,000
	Supervision & Admin.				928,000
	Total Est. First Cost - DAM				$ 15,500,000
	ANNUAL MAINTENANCE				$ 48,000

ENG FORM APR 67 1738 SUPERSEDES ENG FORM 1738, 1 APR 54, WHICH IS OBSOLETE.

GPO : 1967 OF—282-653

REASONABLE CONTRACT ESTIMATE					SHEET 2 OF 3
PROJECT	STANNARD RESERVOIR GENESEE RIVER BASIN, N.Y.	Survey Report May 1967			INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	DIKE (ON MARSH CREEK)				
1	Excavation - Borrow	320,000	C.Y.	0.55	$ 176,000
2	Embankment, Compacted	217,000	C.Y.	0.20	43,400
3	Excavation - Stripping	21,500	C.Y.	0.90	19,350
4	Excavation - Trench	23,000	C.Y.	1.25	28,750
5	Filter Material	10,000	C.Y.	1.50	15,000
6	Rock Fill	30,500	C.Y.	3.00	91,500
7	5' Blanket	53,500	C.Y.	0.20	10,700
	Total Est. Contractor's Earnings				$ 384,700
	Contingencies				77,300
	Total Est. Cont. Earnings Plus Cont.				462,000
	Engineering & Design				50,000
	Supervision & Admin.				33,000
	Total Est. First Cost				$ 545,000
	ANNUAL MAINTENANCE				$ 2,000

ENG FORM APR 67 1738 SUPERSEDES ENG FORM 1738, 1 APR 54, WHICH IS OBSOLETE. GPO : 1967 OF—262-655

REASONABLE CONTRACT ESTIMATE

SHEET 3 OF 3

PROJECT STANNARD RESERVOIR
GENESEE RIVER BASIN, N.Y.

Survey Report
May 1967

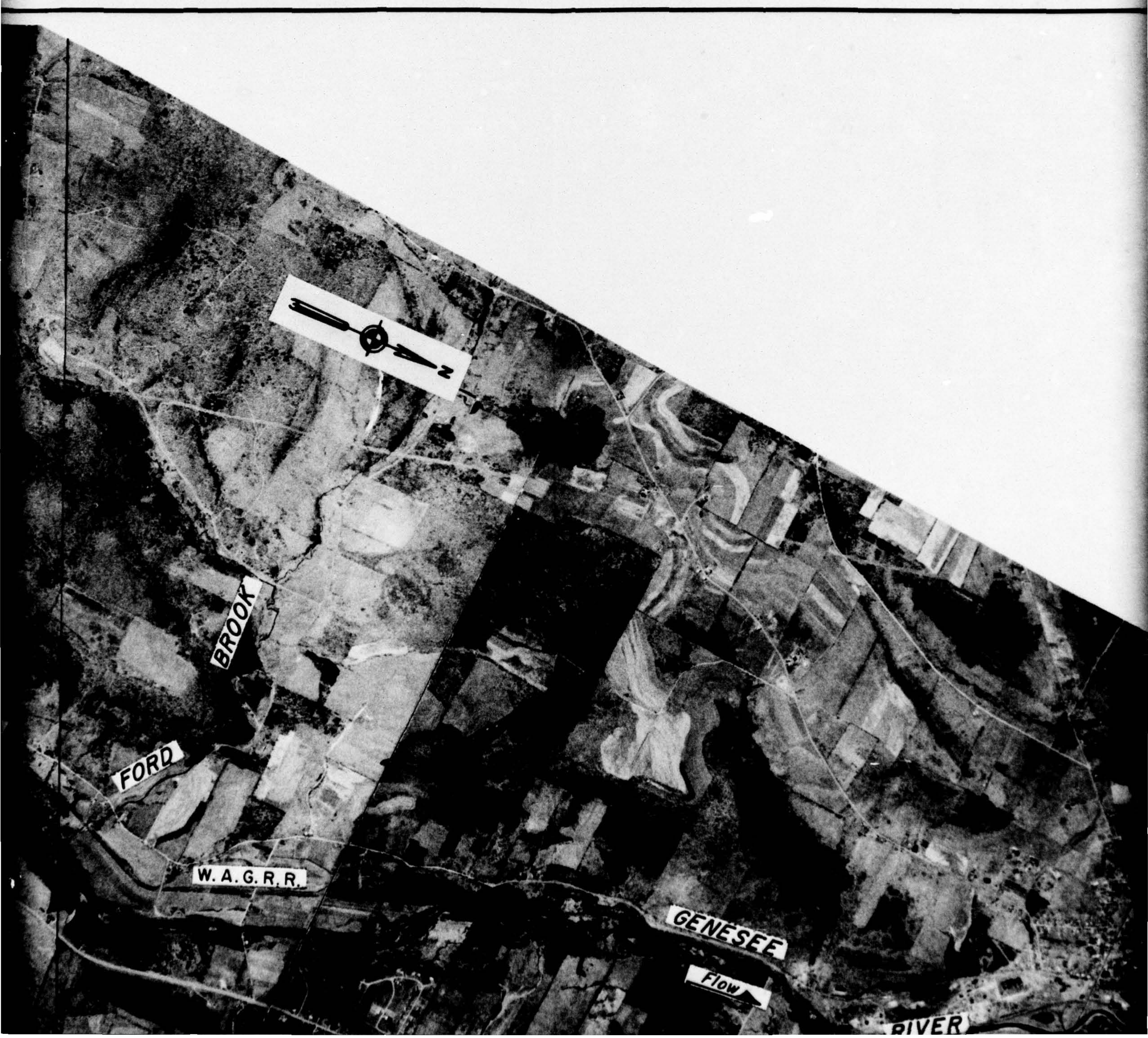
INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	RELOCATIONS				
	HIGHWAYS				
	Relocation of Rt. 19		L.S.		$ 3,600,000
	Reconstruction of County Roads 38 & 29		L.S.		1,130,000
	Relocation & Reconstruction of Misc. County & Town Rds.		L.S.		50,000
	Total Est. Contractor's Earnings - Highways				$ 4,780,000
	RAILROADS				
	Relocation of W.A. & G.R.R.	8	MI.	700,000	$ 5,600,000
	Total Est. Cont. Earnings - Railroad				$ 5,600,000
	UTILITIES				
	Relocate H.P. Gas & Electric Transmission Lines		L.S.		$ 688,000
	Total Est. Cont. Earnings - Utilities				$ 688,000
	Total Est. Cont. Earnings - Relocations				$ 11,068,000
	Contingencies				2,232,000
	Total Est. C.E. & C.				$ 13,300,000
	Engineering & Design				1,460,000
	Supervision & Admin.				940,000
	Total Est. First Cost				$ 15,700,000
	ANNUAL MAINTENANCE				-------

ENG FORM APR 67 1738 SUPERSEDES ENG FORM 1738, 1 APR 54, WHICH IS OBSOLETE. GPO : 1967 OF—262-053

WEST BRANCH
GENESEE RIVER
PA
244
PENNSYLVANIA
NEW YORK
SPILLWAY
DESIGN
POOL
SHONGO
NY
19
PA
449
PA
449
GENESEE
CRYDER
CREEK

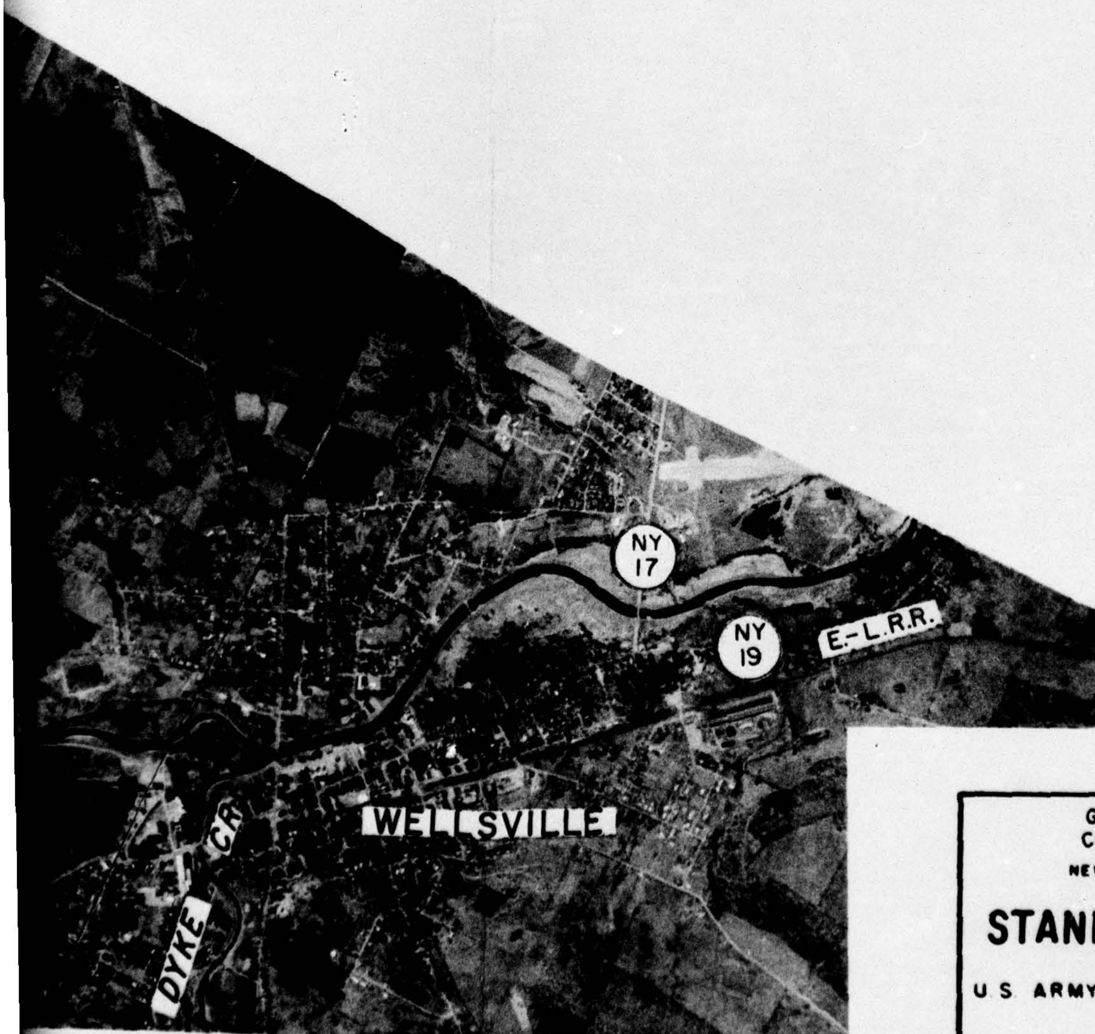

YORKS
CORNERS


N
BROOK
FORD
W. A. G. R. R.
GENESEE
Flow
RIVER

W.A.G.R.R. — WELLSVILLE, ADDISON AND GALETON RAILROAD

E.-L.R.R. — ERIE — LACKAWANNA RAILROAD

SCALE: 1" = 2000' (APPROX.)
PHOTO TAKEN APRIL 1963

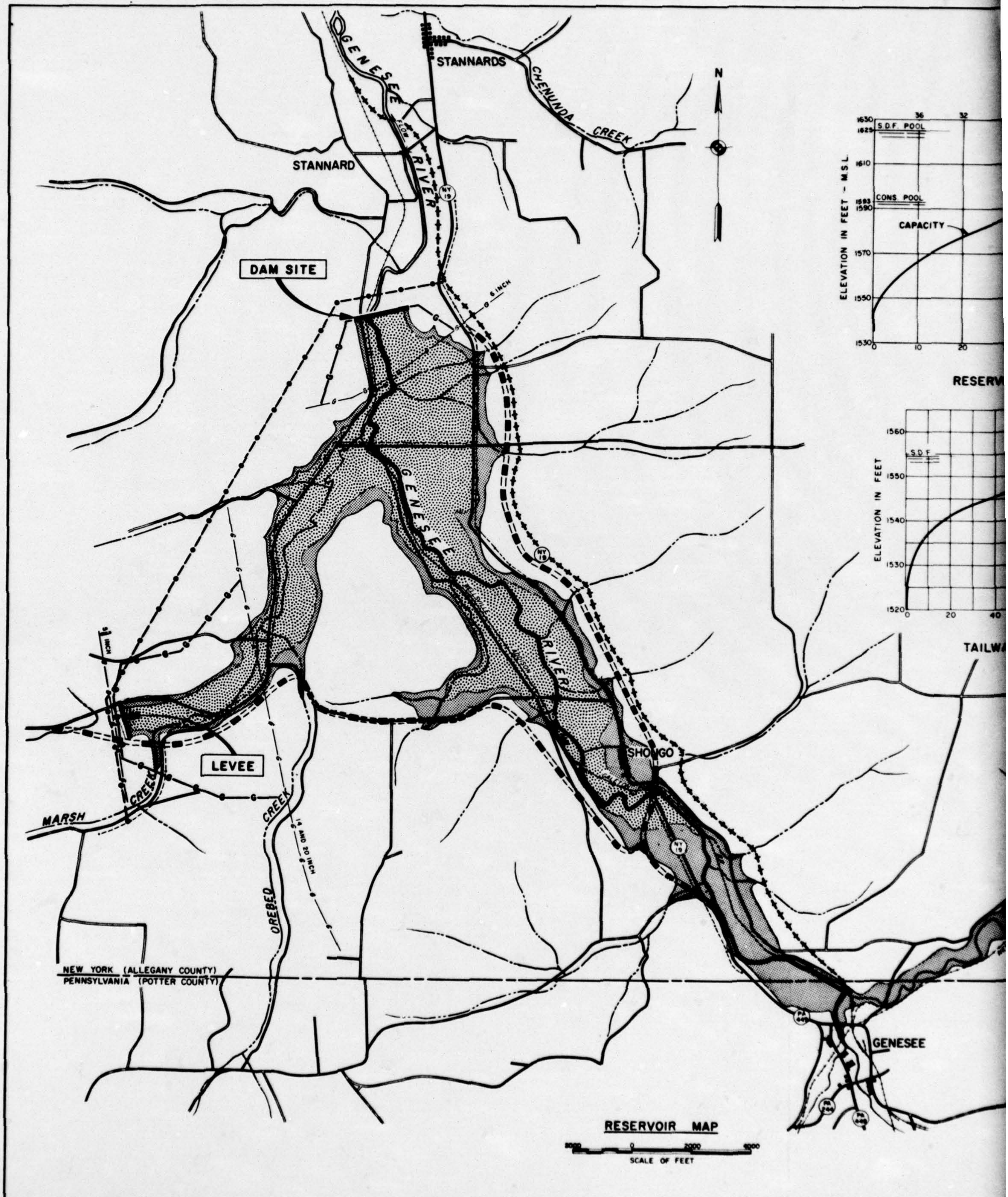


GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

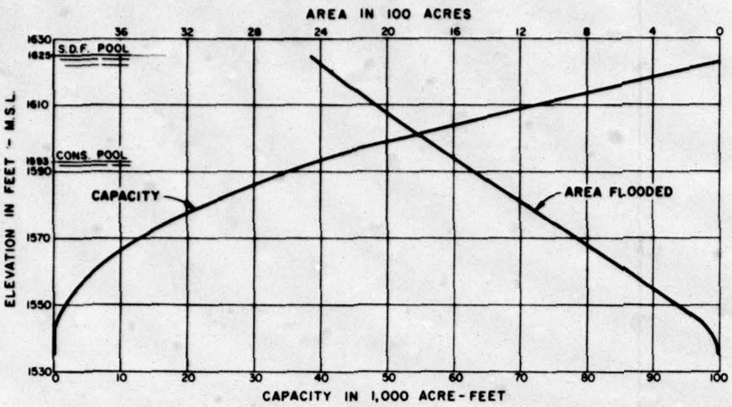
STANNARD RESERVOIR

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

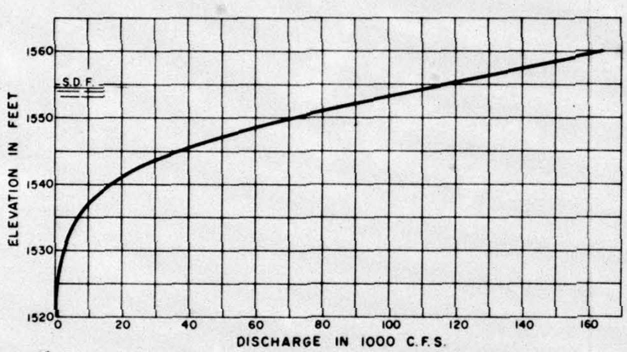
FIGURE C5



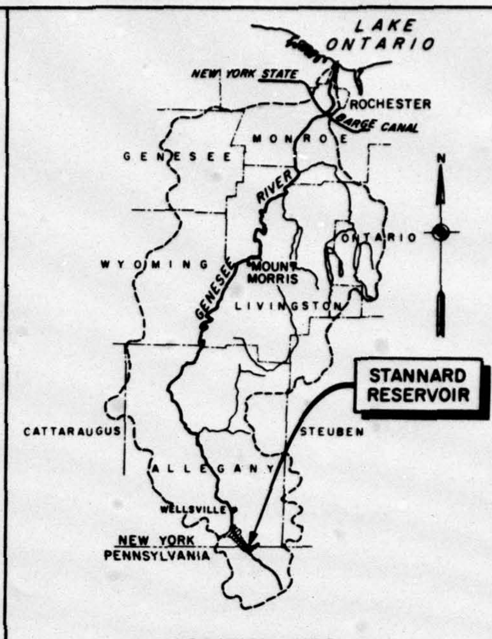
STANNARDS
CHENUNDA CREEK
GENESEE RIVER
STANNARD
N
NY 19
DAM SITE
6 INCH
S.D.F. POOL
CONS. POOL
CAPACITY
ELEVATION IN FEET - M.S.L.
RESERV
ELEVATION IN FEET
S.D.F.
TAILWA
GENESEE RIVER
LEVEE
MARSH CREEK
OREBED CREEK
18 AND 20 INCH
SHONGO
NEW YORK (ALLEGANY COUNTY)
PENNSYLVANIA (POTTER COUNTY)
GENESEE
RESERVOIR MAP
SCALE OF FEET



RESERVOIR AREA AND CAPACITY CURVES



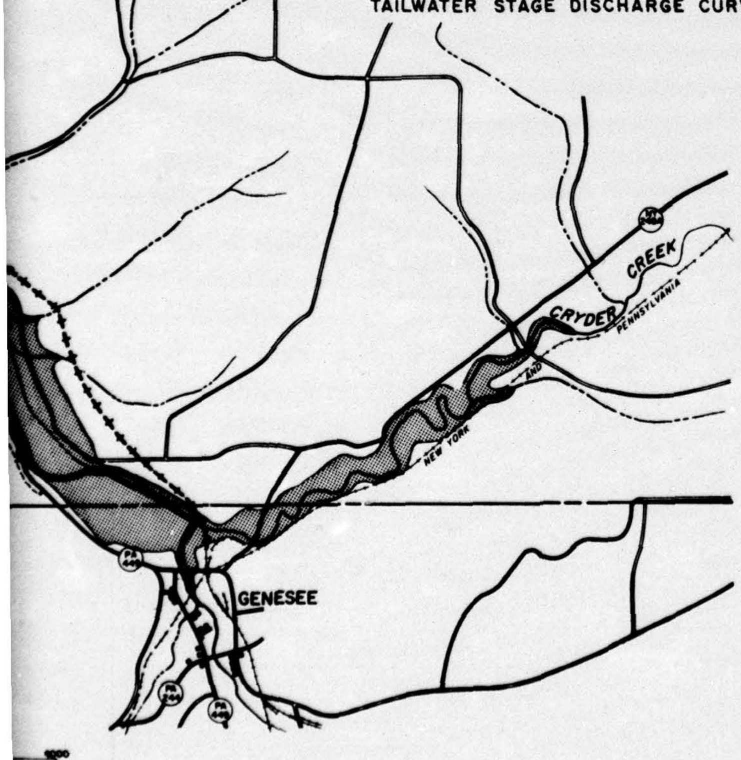
TAILWATER STAGE DISCHARGE CURVE



LOCATION MAP

SCALE IN MILES

3 0 3 6 9



LEGEND

- SPILLWAY DESIGN FLOOD POOL EL. 1625
- MAXIMUM CONSERVATION POOL EL. 1593
- HEAVY DUTY ROAD
- MEDIUM DUTY ROAD
- LIGHT DUTY ROAD
- UNIMPROVED DIRT ROAD
- RAILROAD
- RAILROAD, DISMANTLED
- POWER LINE – 4,800 VOLT
- NATURAL GAS PIPELINE
- PROPOSED RELOCATED HEAVY DUTY ROAD
- PROPOSED RELOCATED MEDIUM DUTY ROAD
- PROPOSED RELOCATED POWER LINE
- PROPOSED RELOCATED NATURAL GAS PIPELINE
- PROPOSED RELOCATED RAILROAD
- EXISTING STREAM

GENESEE RIVER BASIN

COMPREHENSIVE STUDY

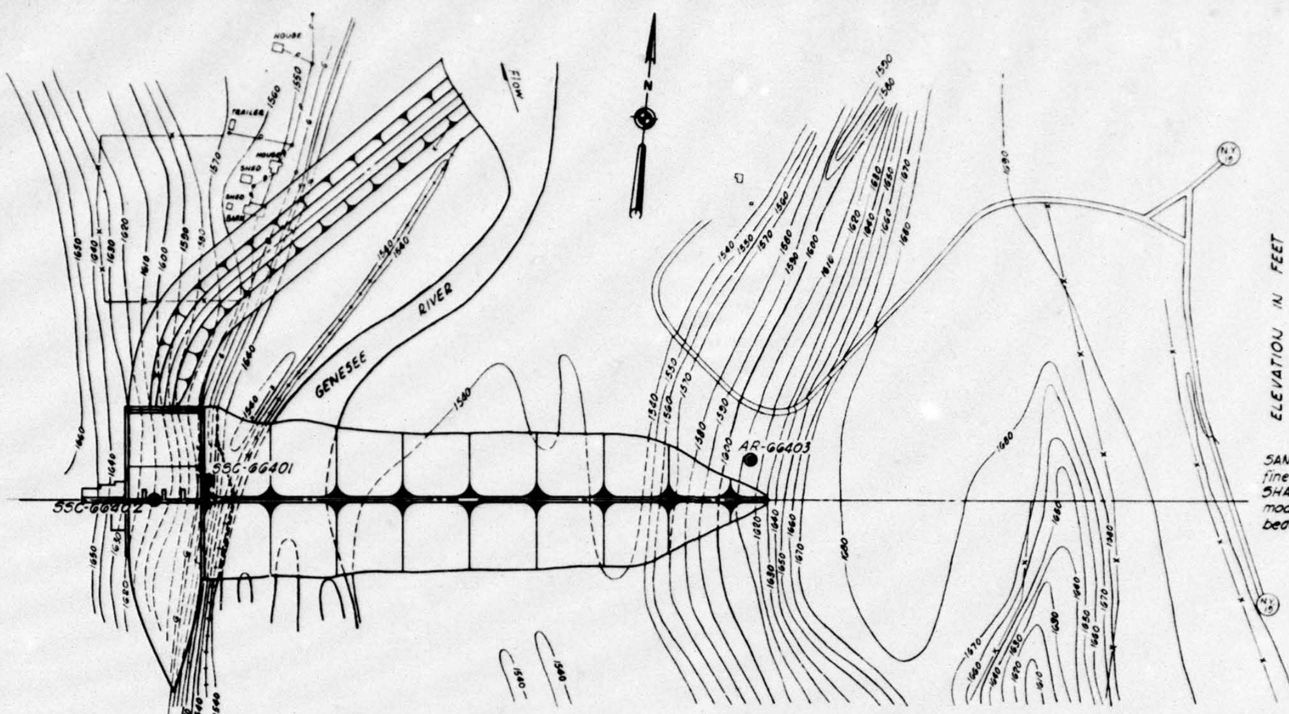
NEW YORK AND PENNSYLVANIA

STANNARD DAM AND RESERVOIR

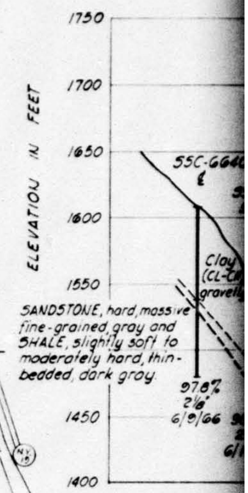
CORPS OF ENGINEERS, BUFFALO DISTRICT

JUNE 1967

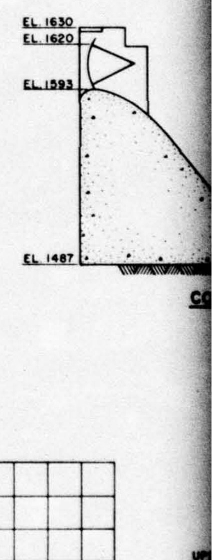
FIGURE C6

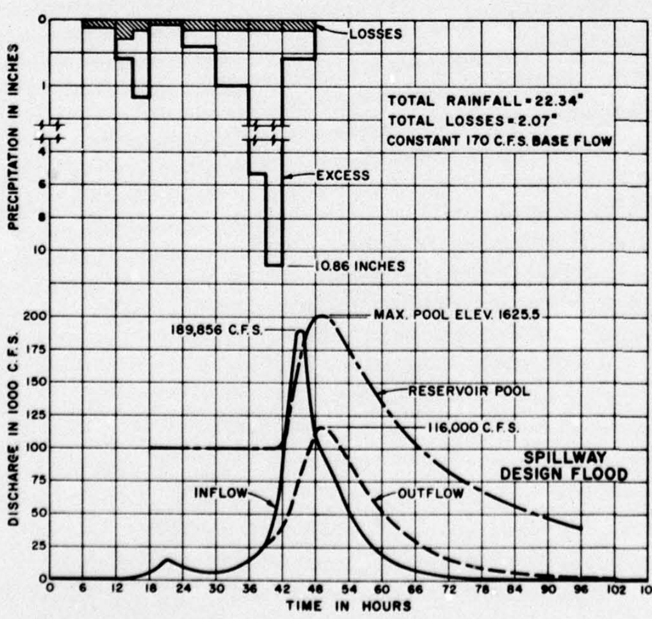


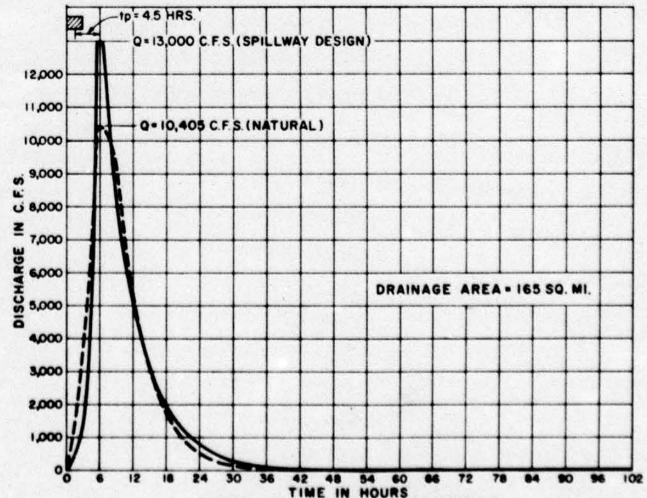
PLAN



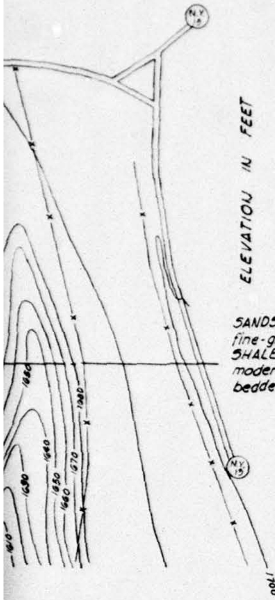
UPSTREAM ELEVATION

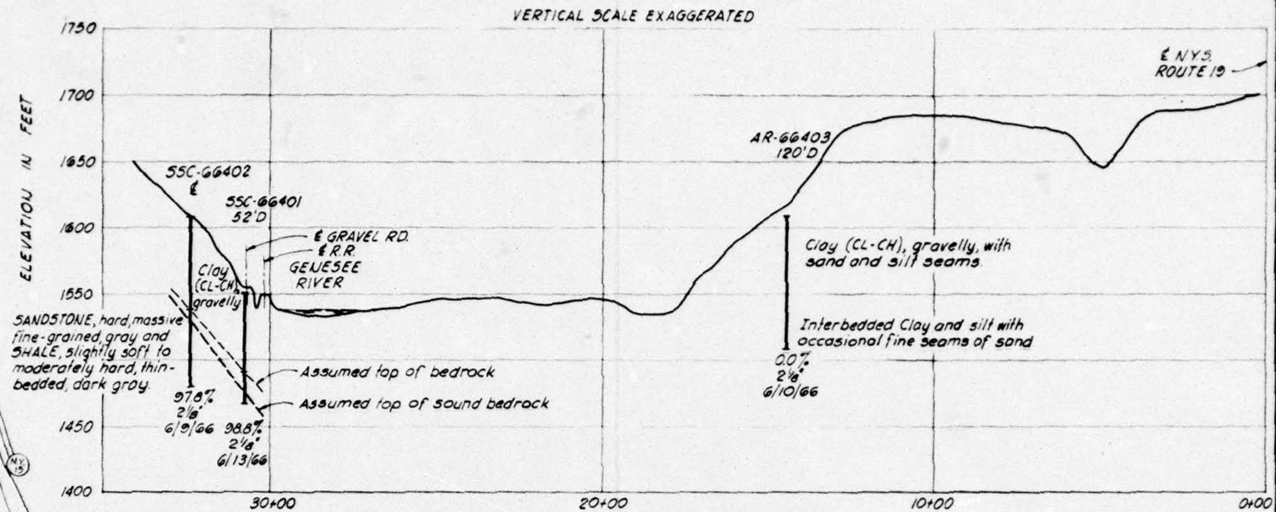






THREE - HOUR UNIT HYDROGRAPHS





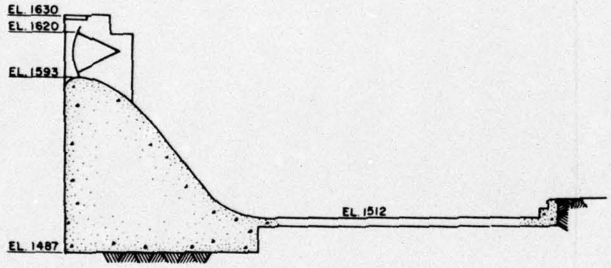
GEOLOGIC PROFILE AT DAMSITE

LEGEND FOR EXPLORATIONS:

HOLE NUMBER AND DESIGNATION	C-66302
*OFFSET	℄
TOP OF HOLE	
ASSUMED TOP OF BEDROCK	
BOTTOM OF HOLE	
PERCENT CORE RECOVERED IN BEDROCK	94.3%
DIAMETER OF BEDROCK CORE	2 1/8"
DATE EXPLORATION COMPLETED	6/2/66

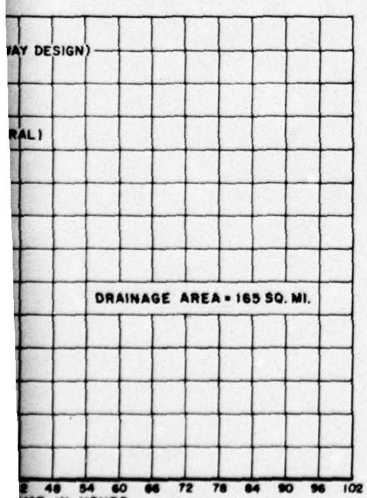
*OFFSET FROM PROFILE OR SECTION MAY BE UPSTREAM OR DOWNSTREAM (U OR D) AS DEFINED

TYPE OF EXPLORATION	CODE DESIGNATION
C	CORE HOLE
AR	AUGER AND/OR ROCKBIT HOLE
SS	SPLIT SPOON SAMPLE
●	VERTICAL EXPLORATION

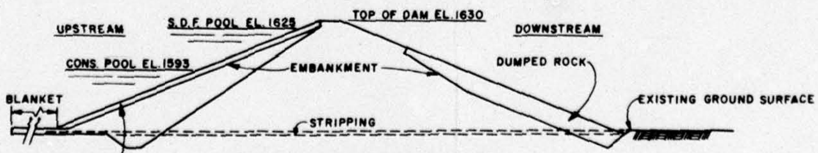


CONCRETE SPILLWAY SECTION

SCALE OF FEET
40' 0 40' 80'



IR UNIT HYDROGRAPHS



TYPICAL SECTION OF EMBANKMENT

SCALE OF FEET
50' 0 50' 100'

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

STANNARD DAM
PLAN AND DETAILS

U. S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE C7

BELFAST RESERVOIR

36. LOCATION

The Belfast dam site is located on the Genesee River in Allegany County, New York, approximately 2.6 miles upstream from Belfast, New York. The reservoir would drain 578 square miles.

37. PERTINENT DATA

RESERVOIR		
1.	Maximum W.S. elev. (Spillway desgin flood pool)	1375
2.	Maximum topography, ft.	1380
3.	Conservation pool, ft.	1357
4.	Flood control pool, ft.	1370
5.	Pool area at maximum W.S. Ac.	4400
6.	Pool area at conservation pool, Ac.	3350
7.	Pool area at flood control pool, Ac.	4150
8.	Channel elev. at toe of dam	1270
9.	Total capacity at flood control pool, Ac. ft.	144,000
10.	Total capacity at conservation pool, Ac. ft.	95,000
11.	Total capacity at flood control pool, in.	4-3/4
DAM		
12.	Top of dam, elev.	1380
13.	Top width, ft.	20
14.	Height of dam, ft.	110
15.	Length, ft.	4900
SPILLWAY		
16.	No. of gates	8
17.	Size of gates, ft.	46.9 x 30
18.	Top of gates, ft.	1370
19.	Crest Elev.	1340
20.	Length (effective), ft.	375
21.	Maximum head on crest (design), ft.	36
22.	Design discharge cfs	262,000
OUTLET WORKS		
23.	No. of conduits	14
24.	Size of each conduit $ft.^2$	30
STILLING BASIN		
25.	Length, ft.	206
26.	Bottom width, ft.(based on assumed pier width)	445
27.	Elev. of bottom	1265
28.	Elev. of end sill	1279

38. INFLOW UNIT HYDROGRAPH

Concurrent stream gage and precipitation data were not available for the Belfast site, therefore a synthetic unit-hydrograph was derived for this area utilizing Clark's Method. Clark's Coefficients Tc and R were obtained from a generalized set of curves of (Tc + R) and R versus drainage area. These curves are shown in APPENDIX E of this report. For the Belfast drainage area the coefficients Tc and R are 15.80 and 11.80 respectively. The resulting 3-hour unitgraph for natural conditions had a maximum discharge of 16,830 cfs. For spillway design purposes, the peak of the natural unitgraph was increased 25 percent giving a maximum discharge of 21,040 cfs. Clark's Method is described in APPENDIX E of this report. Both the natural and the increased unitgraphs are shown on figure C9. Both the outflow hydrograph and reservoir level curves are those which would result with no particular regulating procedure.

39. SPILLWAY DESGIN FLOOD HYDROGRAPH

The spillway design flood hydrograph was obtained by applying the rainfall excess from the maximum probable storm to the increased unit-hydrograph and by routing the resulting discharge through the reservoir spillway. The maximum spillway discharge is 262,000 cfs. Figure C9 shows the spillway design flood hydrograph.

40. HYDRAULIC DESIGN

After consideration of the topography of the Belfast reservoir site, it was decided that elevation 1375 feet would be the maximum permissible since a water surface exceeding 1375 feet would adversely affect Belmont, New York which is to the south. With a conservation pool at elevation 1357, 3 inches of storage could be maintained for recreation, water supply, water quality and pollution abatement. With 30-foot tainter gates, 1-3/4 inches of storage would be available for flood control. A study of the freeboard of the Mt. Morris Reservoir and other reservoirs in the vicinity indicated that the freeboard on the Belfast Reservoir would be adequate. The controlled concrete spillway would be an ogee-shaped weir with a vertical upstream face. Freeboard requirements dictated the maximum water surface allowable for the spillway design flood (1375). With the spillway crest elevation and the height of gates known, the spillway crest length was determined by trial. The spillway design flood was routed through a range of spillway

lengths to determine the minimum length that would pass the spillway design flood without exceeding the maximum pool elevation of 1375. The net length was determined to be 375 feet. The water surface before routing was assumed to be at elevation 1370 which is the full pool elevation. The stilling basin was designed in accordance with the hydraulic design criteria set forth in EM1110-2-1603, "Hydraulic Design of Spillways", Corps of Engineers. The maximum design flood pool elevation and discharge were used in determining the D1, D2 depths. Tailwater elevations were obtained from a conveyance curve which was based on a cross-section located downstream from the dam site and was taken from a U.S.G.S. topographic map. The apron slab would be 445 feet wide by 206 feet long. The apron slab elevation was obtained by a direct solution method described in "Hydraulic Energy Dissipators", by Elevatorski. The slab elevation was determined to be 1265. The end sill would be 14 feet high. An outlet works with a cross-sectional area of 420 square feet would insure a discharge of 11,500 cfs under conservation conditions (1557). A discharge of 11,500 cfs would be the zero damage flow downstream and would give a reasonable draining time.

41. SUBSURFACE INVESTIGATIONS

At the Belfast site (2)NX core borings and (1)NX rockbit boring were drilled by the Mobile District for the Buffalo District in June 1966. The borings are located on a adjacent to the dam axis and are shown on figure C10.

42. OVERBURDEN MATERIALS

At the upper portion of the left abutment where ground surface elevation is about 1410, the material consists of a thin mantle of approximately 15 feet of clay. At lower elevations, east of Route 19, the overburden increases in thickness to about 40 feet of glacial till, mainly clay. On the right abutment, rock was not contacted to a depth of 151 feet. Approximately 20 to 25 feet of silty sands and gravels overlie clay along the right bank of the river. It is probable that clay underlies the riverbed.

43. FOUNDATION CONDITIONS

The initial drilling indicates that the left abutment is the most suitable location for the concrete spillway structure founded on rock. The proposed structure would be supported by

hard, fine-grained, massive, jointed, calcareous, gray sandstone and moderately hard, thin-bedded, jointed dark gray shale. The borings indicated that sound rock is from 39 to 60 feet below the ground surface in the vicinity of the proposed concrete structure.

44. LEAKAGE CONDITIONS

Pressure tests and water losses during drilling indicated that the rock varies from fairly tight to open, therefore moderate grouting would be required for the structure and abutment cut off in rock.

45. CONSTRUCTION MATERIALS

It is believed that random and impervious materials as well as sand and gravel are available not too distant from the site. Old sandstone quarries have been reported in the general area from which riprap may be obtained. These quarries lie within a radius of 20 miles from the site and would require reactivating. Concrete aggregates are avilable from quarries at Stafford, Le Roy, Rochester and Buffalo, New York.

46. DESIGN DETAILS

The proposed rolled earth riprap protected embankment would have a length of 4900 feet and would rise about 110 feet above the valley floor. The crown width at top elevation of 1380 would be 20 feet. The reinforced concrete spillway would be founded in rock at the left abutment. The spillway would be regulated by eight radial gates which would be 30 feet high by 47 feet long and would be supported by seven piers, 10 feet wide. The stilling basin would be founded in rock. The outlet works would consist of 14 conduits, each controlled by two slide gates. One gate would be in reserve for emergency closure.

47. RELOCATIONS

The reservoir would necessitate the relocation of the following:

12 miles of 10-inch high pressure gasline
12 miles of 14-inch high pressure gasline
3.2 miles of Erie-Lackawanna Railroad
10.6 miles of heavy duty road
2.3 miles of medium duty road
Realignment of Southern Tier Expressway
1 compressor station

Relocations are shown on figure C9.

48. LAND REQUIREMENTS

Estimated land requirements for the reservoir at SDF elevation would be 4400 acres including 90 acres within the Village of Belmont, New York. At conservation pool the estimated land requirements would be 3350 acres. At the time of 1966 survey, the reservoir would require the acquisition of the following buildings:

89 Buildings within Village of Belmont
21 Buildings within Village of Belvidere
30 Buildings within Town of Amity
18 Buildings within Town of Belfast
1 Building within Town of Friendship
2 Cemeteries (300 graves)
Borden Company
Allegany Bitumen Company

The reservoir location is shown on figure C9. Real estate first costs are shown in table C2.

49. CONCLUSIONS

The Belfast site was not included in the basin development plans because of its unfavorable benefit-cost ratio. The high cost of relocations, relatively small amount of flood control storage and no possibilities for power development were the major reasons for the low benefit-cost ratio.

50. COST ESTIMATES

Totals of the following preliminary cost estimates were used to obtain the dam and reservoir, real estate and investment first costs but the breakdown of the cost estimate is shown for informational purposes only.

REASONABLE CONTRACT ESTIMATE

SHEET 1 OF 2

PROJECT BELFAST DAM & RESERVOIR
TOP OF DAM ELEV. 1380 FOR 4-3/4" STORAGE   Oct. '66

INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	DAM & RESERVOIR				
1	Cofferdam & Care of Water		L.S.		$ 100,000.00
2	Clearing	1,400	ACRE	200.00	280,000.00
3	Stripping	216,000	C.Y.	0.80	172,800.00
4	Excavation - Borrow	3,370,000	C.Y.	0.45	1,516,500.00
5	Excavation - Earth	600,000	C.Y.	0.70	420,000.00
6	Excavation - Rock	1,000,000	C.Y.	3.50	3,500,000.00
7	Excavation - Trenching	76,500	C.Y.	1.00	76,500.00
8	Earth Embankment	2,980,000	C.Y.	0.16	476,800.00
9	Rock Fill	402,300	C.Y.	12.50	5,028,750.00
10	Filter Sand & Gravel	71,000	C.Y.	3.00	213,000.00
11	Upstream Blanket	360,000	C.Y.	0.20	72,000.00
12	Concrete Reinforced	24,500	C.Y.	34.00	833,000.00
13	Concrete Mass	284,700	C.Y.	18.00	5,124,600.00
14	Portland Cement	318,400	BBL.	5.00	1,592,000.00
15	Re-Steel	1,225,000	LB.	0.13	159,250.00
16	Slide Gates	420	TON	1,200.00	504,000.00
17	Tainted Gates	720	TON	1,500.00	1,080,000.00
18	Hoists	156	TON	2,000.00	312,000.00
19	Spillway Bridge	7,500	S.F.	25.00	187,500.00
20	Misc. Items		L.S.		2,165,000.00
	Total Dam & Reservoir				$23,813,700.00
	Contingencies @ 25% ±				5,986,300.00
	Total Dam & Res. Incl. Contingencies				$29,800,000.00
	RELOCATIONS				
1	10" Gas Line	12	MI.	90,000.00	$ 1,080,000.00
2	14" Gas Line	12	MI.	100,000.00	1,200,000.00
3	Compressor Station		L.S.		50,000.00
	Sub-Total Relocations				$ 2,330,000.00
	Contingencies @ 25% ±				589,000.00
	Sub-Total Incl. Cont.				$ 2,919,000.00
4	Highway Relocation Incl. Cont. From N.Y. State				10,715,000.00
5	Railroad " " " " " "				2,766,000.00
	Total Relocations Inc. Contingencies				$16,400,000.00
	Total Construction Costs				$46,200,000.00
	Government Costs				
	Engineering & Design				4,200,000.00
	Supervision & Admin.				3,600,000.00
	Total Govt. Costs				$ 7,800,000.00
	Total Dam, Relocations, & Govt. Costs				$54,000,000.00
	N.Y. State Cost to Raise the Present Alignment Of the Southern Tier Expressway				10,591,000.00
	TOTAL COST				$64,591,000.00

ENG FORM APR 67 1738 SUPERSEDES ENG FORM 1738, 1 APR 54, WHICH IS OBSOLETE.   GPO 1967 OF—262-653

REASONABLE CONTRACT ESTIMATE

SHEET 2 OF 2

PROJECT BELFAST DAM & RESERVOIR
TOP OF DAM ELEV. 1380 4-3/4" OF STORAGE Oct.'66

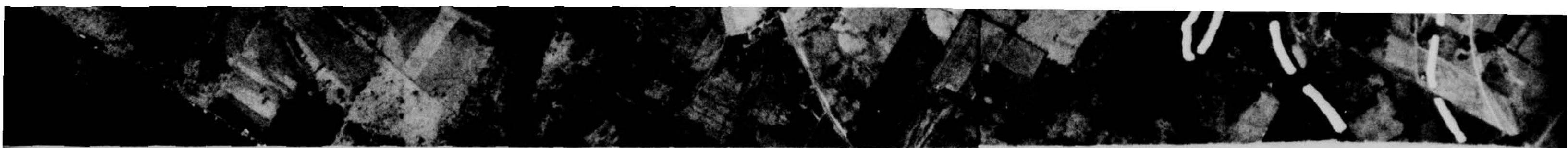
INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	SCHEME C - Southern Tier Expressway				
	Total C. E. + C. & Govt. Costs (Present Alignment)				$ 54,000,000.00
	Savings over the Present Alignment Reconstruction of Rt. 408 ($2,227,000 - 1,944,000)				- 283,000.00
	R.R. Relocations ($2,766,000 - 1,000,000)				- 1,766,000.00
	Less Government Costs of: ($283,000 - 1,766,000) 16.9%±				- 394,000.00
	N.Y.S. Cost to Raise Scheme C of the Southern Tier Expressway				2,443,000.00
	Total Cost Scheme C, Except Lands, Easements & Rights-of-way				$ 54,000,000.00
	PRELIMINARY				
	(No page II-C30)				

ENG FORM 1738 APR 67 SUPERSEDES ENG FORM 1738, 1 APR 54, WHICH IS OBSOLETE.

GPO : 1967 OF—262-653


NY 19
ERIE-LACKAWANNA R.R.
CREEK



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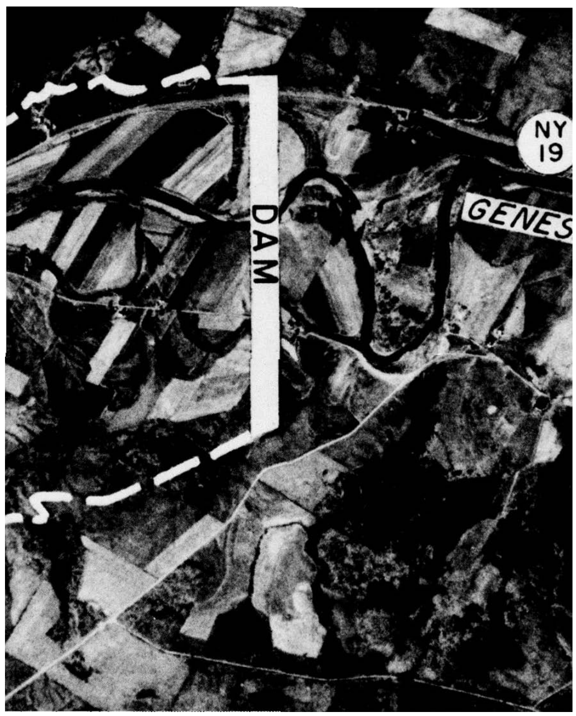
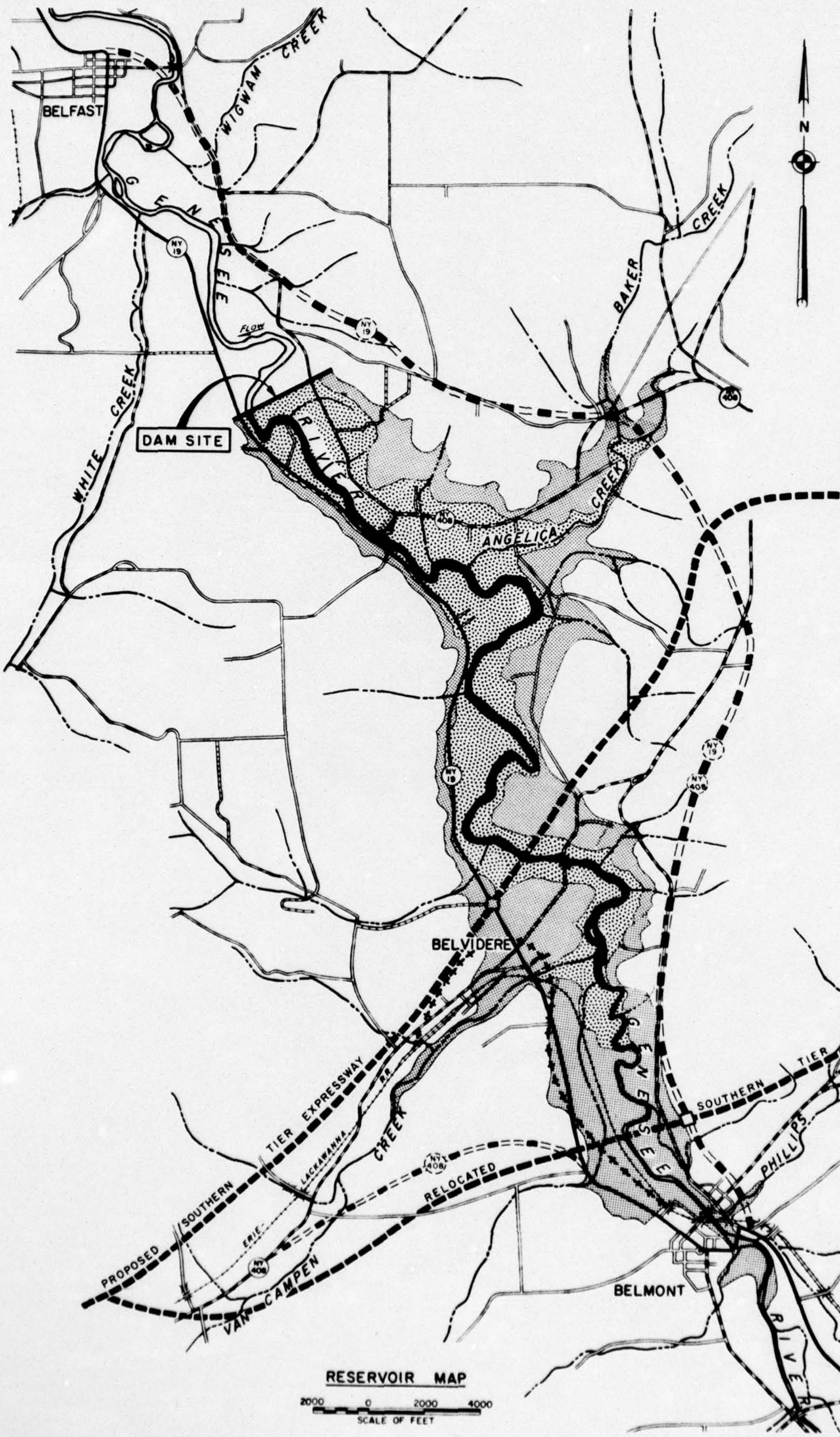
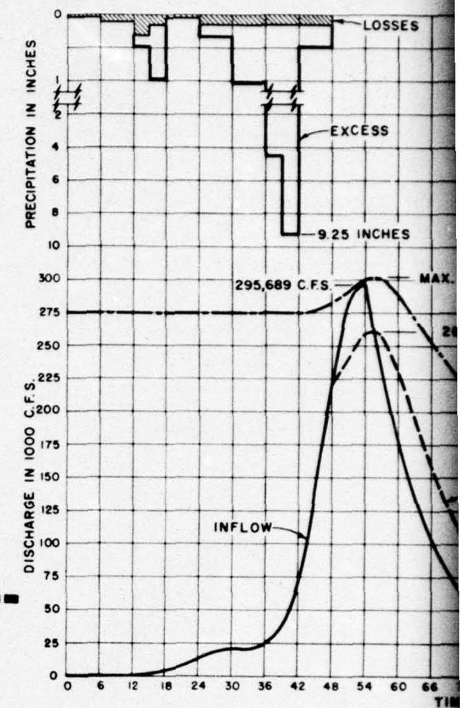
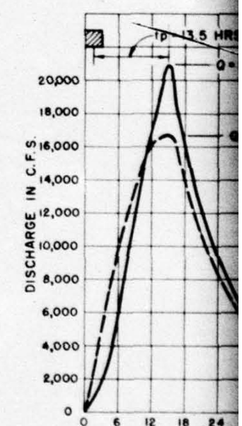
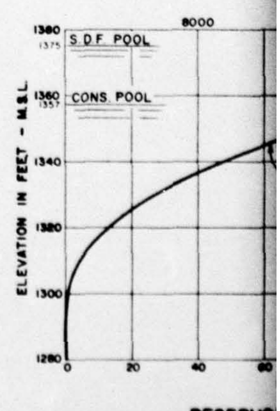

DAM
NY
19
GENES

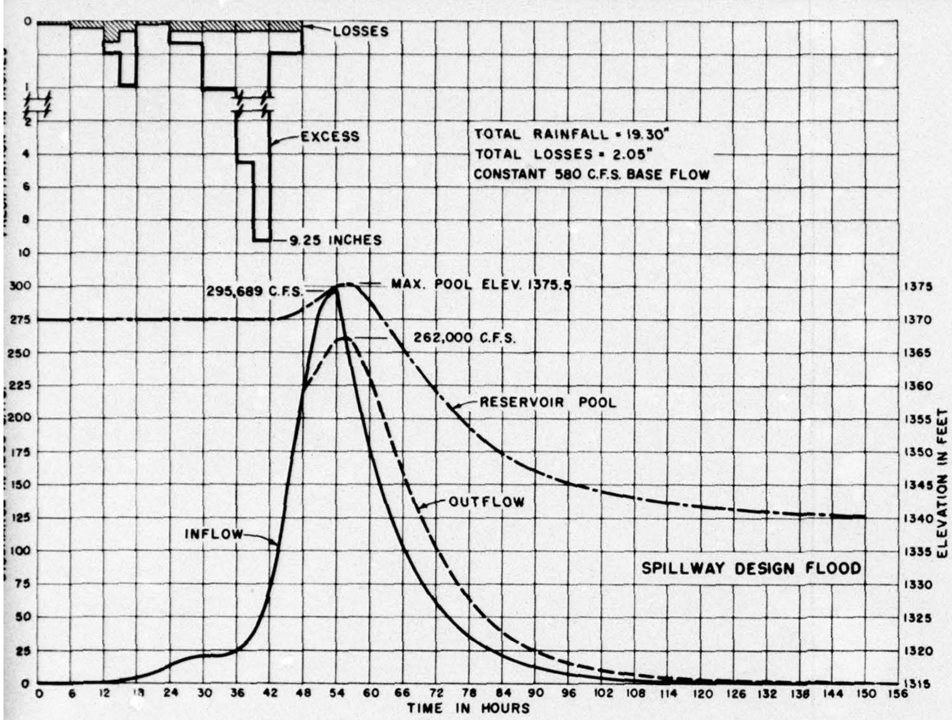


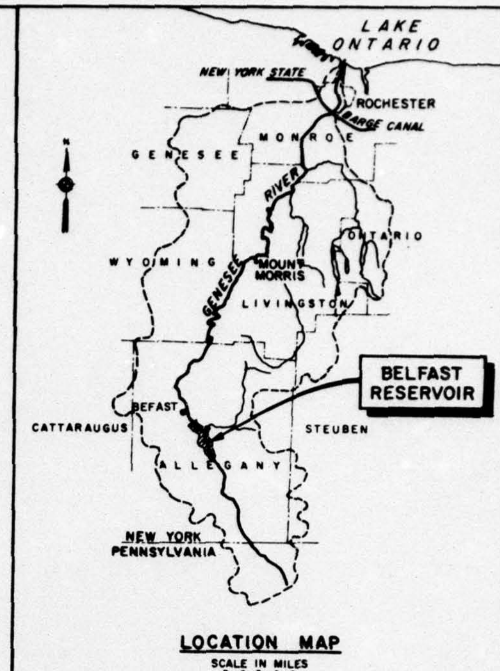
RESERVOIR MAP









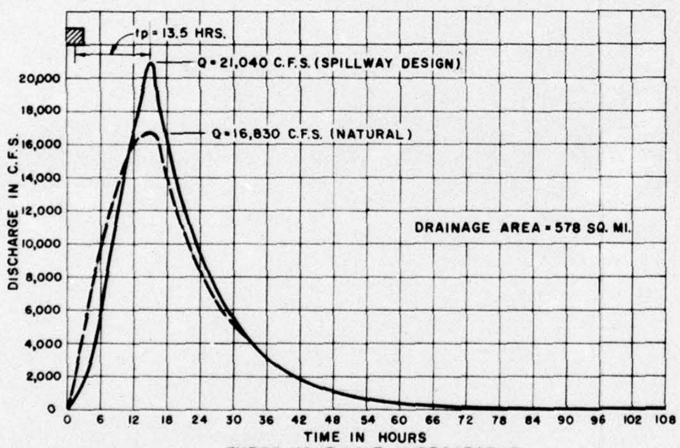


LOCATION MAP

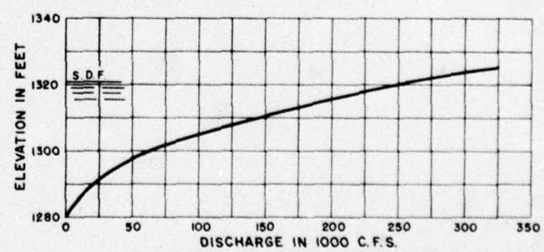
SCALE IN MILES

LEGEND:

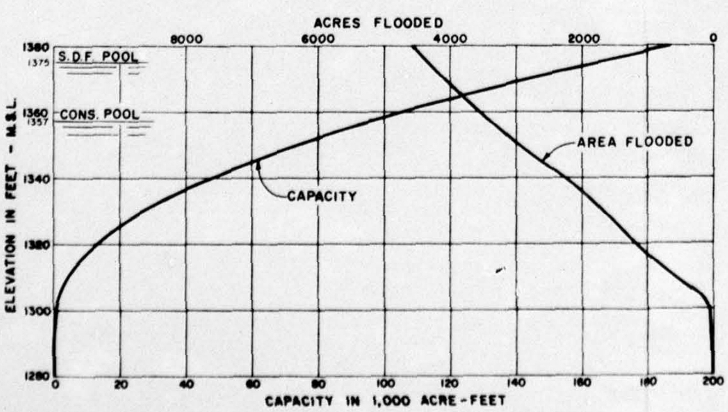
- SPILLWAY DESIGN FLOOD POOL EL. 1375
- MAXIMUM CONSERVATION POOL EL. 1357
- HEAVY DUTY ROAD
- MEDIUM DUTY ROAD
- IMPROVED ROAD, GRAVEL
- UNIMPROVED ROAD
- PROPOSED RELOCATED HEAVY DUTY ROAD
- PROPOSED RELOCATED MEDIUM DUTY ROAD
- SOUTHERN TIER EXPRESSWAY
- INTERCHANGE
- RAILROAD
- PROPOSED RELOCATED RAILROAD
- EXISTING STREAM



THREE-HOUR UNIT HYDROGRAPHS



TAILWATER STAGE DISCHARGE CURVE



RESERVOIR AREA AND CAPACITY CURVES

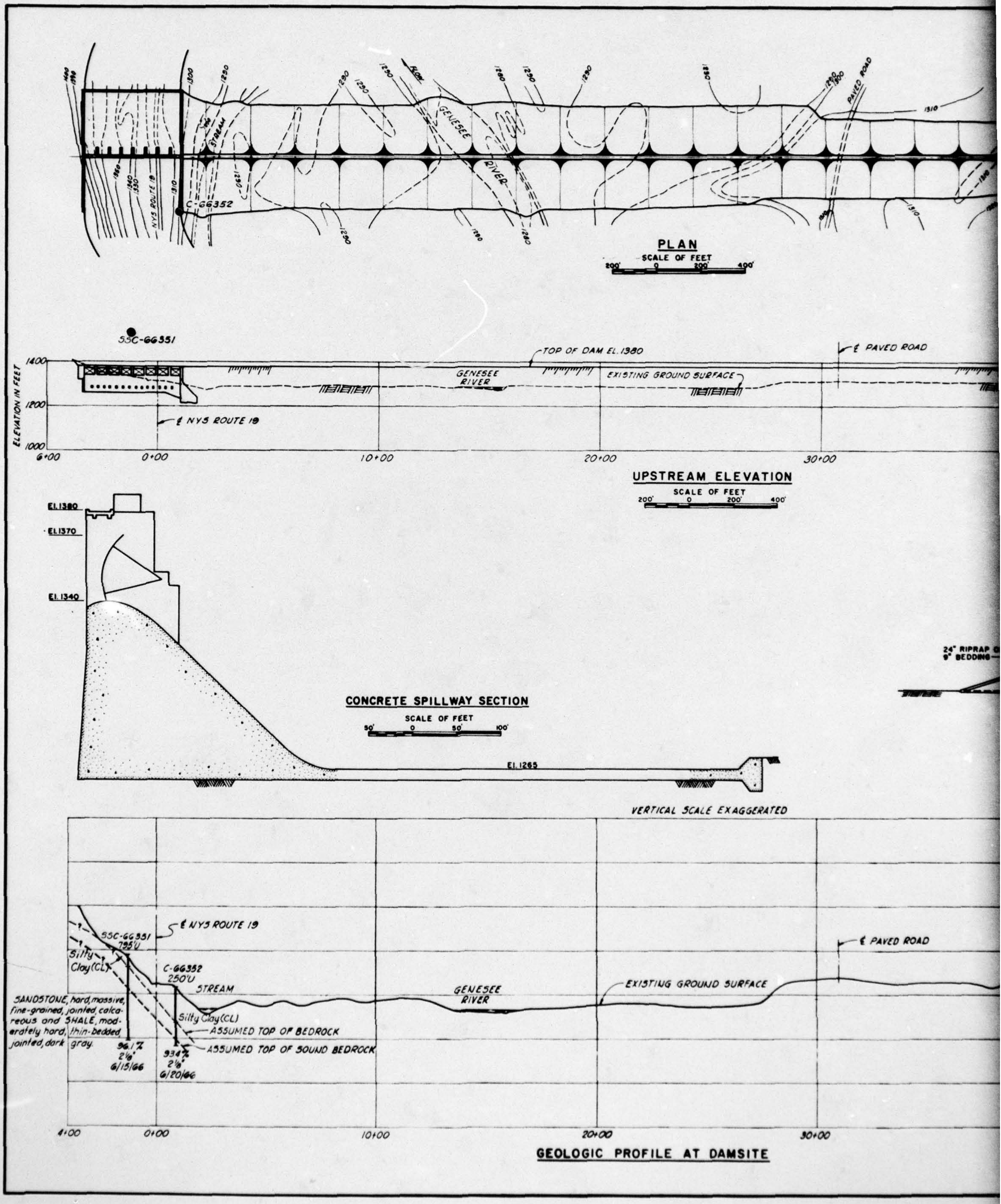
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

BELFAST DAM AND RESERVOIR

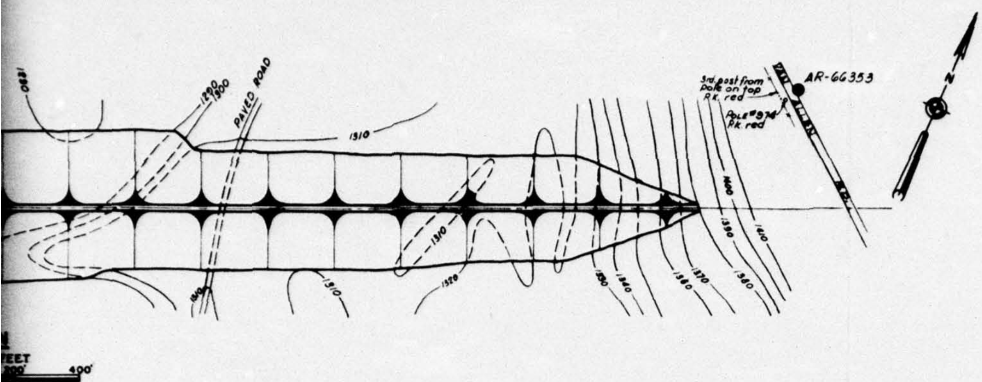
CORPS OF ENGINEERS, BUFFALO DISTRICT

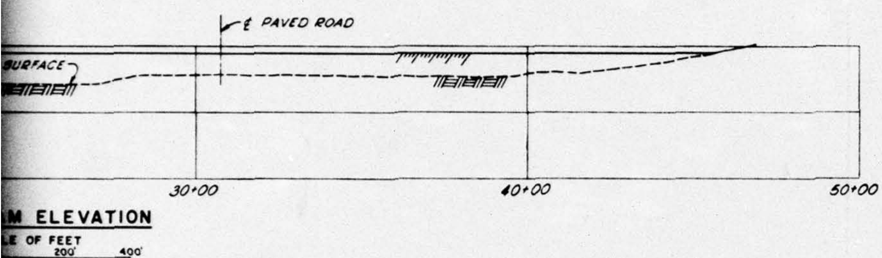
JUNE 1967

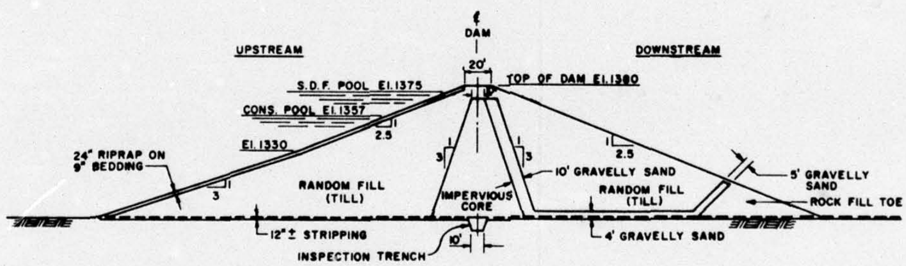
FIGURE C9



FLOW
STREAM
GENESEE
RIVER
NYS ROUTE 19
C-66352
PAVED ROAD
PLAN
SCALE OF FEET
200' 0 200' 400'
SSC-66351
TOP OF DAM EL. 1380
℄ PAVED ROAD
GENESEE RIVER
EXISTING GROUND SURFACE
℄ NYS ROUTE 19
ELEVATION IN FEET
1400
1200
1000
6+00
0+00
10+00
20+00
30+00
UPSTREAM ELEVATION
SCALE OF FEET
200' 0 200' 400'
EL. 1380
EL. 1370
EL. 1340
CONCRETE SPILLWAY SECTION
SCALE OF FEET
50' 0 50' 100'
EL. 1265
24" RIPRAP
9" BEDDING
VERTICAL SCALE EXAGGERATED
℄ NYS ROUTE 19
SSC-66351
795'U
Silty Clay (CL)
C-66352
250'U
STREAM
SANDSTONE, hard, massive, fine-grained, jointed, calcareous and SHALE, moderately hard, thin-bedded, jointed, dark gray.
Silty Clay (CL)
ASSUMED TOP OF BEDROCK
ASSUMED TOP OF SOUND BEDROCK
96.1%
2 1/8"
6/15/66
93.4%
2 1/8"
6/20/66
GENESEE RIVER
EXISTING GROUND SURFACE
℄ PAVED ROAD
4+00
0+00
10+00
20+00
30+00
GEOLOGIC PROFILE AT DAMSITE



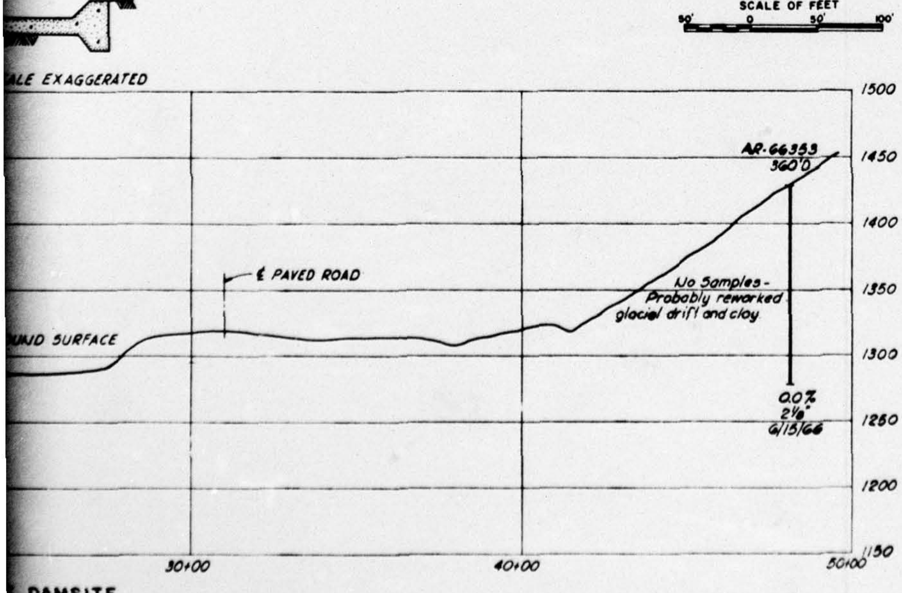




TYPICAL SECTION

SCALE OF FEET

50' 0 50' 100'



LEGEND FOR EXPLORATIONS:

HOLE NUMBER AND DESIGNATION → C-66302
*OFFSET → ℄
TOP OF HOLE →
ASSUMED TOP OF BEDROCK →
BOTTOM OF HOLE →
PERCENT CORE RECOVERED IN BEDROCK → 94.3%
DIAMETER OF BEDROCK CORE → 2 1/8"
DATE EXPLORATION COMPLETED → 6/2/66

*OFFSET FROM PROFILE OR SECTION MAY BE UPSTREAM OR DOWNSTREAM (U OR D) AS DEFINED

TYPE OF EXPLORATION	CODE DESIGNATION
C	CORE HOLE
AR	AUGER AND/OR ROCKBIT HOLE
SS	SPLIT SPOON SAMPLE
●	VERTICAL EXPLORATION

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

BELFAST DAM
PLAN AND DETAILS

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE C10

ANGELICA RESERVOIR

51. LOCATION

The Angelica dam site is located on Angelica Creek in Allegany County, New York, approximately one mile upstream from the outskirts of Angelica, New York. The reservoir would drain a 54 square mile area.

52. PERTINENT DATA

RESERVOIR

1.	Maximum W.S. elev. (Spillway design flood pool)	1595
2.	Maximum topography, ft.	1600
3.	Conservation pool elev. ft.	1574
4.	Pool area at maximum W.S.,Ac	1350
5.	Pool area at conservaiton pool, Ac.	870
6.	Channel elev. at toe of dam	1464
7.	Total capacity at conservation pool, Ac. ft.	28,800
8.	Total capacity at conservation pool, in.	10
DAM		
9.	Top of dam, elev.	1600
10.	Top width, ft.	20
11.	Height of dam, ft.	130
12.	Length, ft.	3870
SPILLWAY		
13.	Crest elev.	1574
14.	Length (effective), ft.	225
15.	Maximum head on crest (design), ft.	21
16.	Design discharge cfs	69,000
OUTLET WORKS		
17.	No. of conduits	2
18.	Size of each conduit, $ft.^2$	30
STILLING BASIN		
19.	Length, ft.	165
20.	Bottom width, ft.	225
21.	Elev. of bottom	1444
22.	Elev. of end sill	1454

53. INFLOW UNIT HYDROGRAPH

Stream gage and precipitation data were available for Angelica Creek at Angelica, New York. Clark's Coefficients, Tc and R, obtained from these data were 2.50 and 2.40 respectively. With the computer program 23-J2-L228, Unit Hydrograph and Hydrograph Computation, prepared by the Hydraulic Engineering Center and modified in part by the Buffalo District, a 3-hour unit-hydrograph was prepared for the drainage area above the Angelica dam site (54 sq. mi.). The peak of the natural unitgraph was 6532 cfs. For spillway design purposes, the peak of the natural unitgraph was increased 25 percent giving a maximum discharge of 8170 cfs. Clark's method is described in APPENDIX E of this report. Both the natural and increased unitgraphs are shown on figure C12.

54. SPILLWAY DESIGN FLOOD HYDROGRAPH

The spillway design flood hydrograph was obtained by applying the rainfall excess from the maximum probable storm to the increased unit-hydrograph and by routing the resulting discharge through the reservoir spillway. The maximum spillway design discharge is 69,000 cfs. Figure C12 shows the spillway design flood hydrograph.

55. HYDRAULIC DESIGN

After consideration of the topography of the Angelica reservoir site, it was decided that elevation 1595 feet would be the maximum permissible. With a conservation pool at elevation 1574, 10 inches of storage could be maintained for recreation, water supply, water quality and pollution abatement. A study of the freeboard of the Mt. Morris Reservoir and other reservoirs in the vicinity indicated that the freeboard in the Angelica Reservoir would be adequate. The uncontrolled concrete spillway would be an agee-shaped weir with a vertical upstream face. Freeboard requirements dictated the maximum water surface allowable for the spillway design flood (1595). With the spillway crest known, the spillway crest length was determined by trial. The spillway design flood was routed through a range of spillway lengths to determine the minimum length that would pass the spillway design flood without exceeding the maximum pool elevation. The net length was determined to be 225 feet. The water surface before routing was assumed to be at elevation 1574 which is the full pool elevation. The stilling basin was designed in accordance with the hydraulic design criteria set forth in EM1110-2-1603, "Hydraulic Design of Spillways", Corps

AD-A041 703 CORPS OF ENGINEERS BUFFALO N Y BUFFALO DISTRICT F/G 8/6

GENESEE RIVER BASIN COMPREHENSIVE STUDY OF WATER AND RELATED LA--ETC(U)

JUN 69

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5 OF 6

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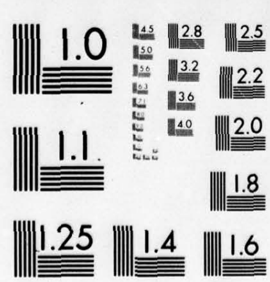


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

of Engineers. The maximum design flood pool elevation and discharge were used in determining the D1, D2 depths. Tailwater elevations were obtained from a conveyance curve which was based on a cross-section located downstream from the damsite and taken from a U.S.G.S. topographic map. The apron slab would be 225 feet wide by 165 feet long. The apron slab elevation was obtained by a direct solution method described in, "Hydraulic Energy Dissipators", by Elevatorski. The slab elevation was determined to be 1444. The end sill would be 10 feet high. The outlet works would have a cross-sectional area of 60 square feet to insure a flow of 2000 cfs under conservation pool conditions (1574). This flow would be the mean annual peak flow and would allow a reasonable draining time.

56. SUBSURFACE INVESTIGATIONS

At the Angelica site (2)NX Core borings and (1)NX rockbit boring were drilled by the Mobil District for the Buffalo District in May and June, 1966. The borings are located along the dam axis and are shown on figure C13.

57. OVERBURDEN MATERIALS

The overburden varies in thickness from about 25 feet on the right abutment, to the valley where it is greater than 100 feet thick. Thus, it is assumed that rock beneath the left abutment is very deep also. The overburden consists mainly of gravelly clay in the upper 25 feet and changes to a compact till below.

58. FOUNDATION CONDITIONS

The initial drilling indicates that the right abutment is the most suitable location for the concrete spilling structure founded on rock. The proposed structure would be supported by slightly soft to moderately hard, thin-bedded, moderately jointed, dark gray shale that contains thin, hard, fine to medium-grained sandstone beds. The borings indicate that sound rock is from 50 to 103 feet below the ground surface in the vicinity of the proposed structure.

59. LEAKAGE CONDITIONS

Pressure tests and water lost during drilling indicate that the rock is fairly tight and only minimum grouting would be required for the structure and abutment cut-off in rock.

60. CONSTRUCTION MATERIALS

Impervious and random fill is available in the immediate area, and numerous sand and gravel pits exist also. Sources of concrete aggregate which have, in the past, been approved by the Corps of Engineers are located at Stafford, Le Roy, Rochester and Buffalo, New York.

61. DESIGN DETAILS

The proposed rolled earth embankment would have a length of 3870 feet and would rise about 130 feet above the valley floor. The crown width at top elevation of 1600 would be 20 feet. The reinforced concrete and uncontrolled spillway would be founded on rock at the right abutment. The stilling basin would be founded on rock. The outlet works would consist of 2 conduits each controlled by two slide gates. One gate would be in reserve for emergency closure.

62. RELOCATIONS

The reservoir would necessitate the relocation of 1.5 miles of medium duty road and approximately 2 miles of the Southern Tier Expressway.

63. LAND REQUIREMENTS

Estimated land requirements for the reservoir would be 1350 acres. At the time of the 1966 survey, the reservoir would require the acquisition of 22 buildings in the Town of Angelica, 6 buildings in the Town of West Almond and the Allegany County Home and Farm.

64. CONCLUSIONS

The Angelica site was not included in the basin development because of its unfavorable benefit-cost ratio. The high cost of rock and common excavation, lack of flood control storage and no possibilities for power development were the major reasons for the low benefit-cost ratio.

65. COST ESTIMATES

Totals of the following preliminary cost estimates were used to obtain the dam and reservoir, real estate and investment first costs but the breakdown of the cost estimate is shown for informational purposes only.

REASONABLE CONTRACT ESTIMATE

SHEET OF

PROJECT ANGELICA DAM & RESERVOIR - 10" STORAGE
GENESEE RIVER BASIN

Oct.'66

INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	DAM & RESERVOIR				
1	Cofferdam & Care of Water		L.S.		$ 75,000
2	Clearing	300	ACRE	200.00	60,000
3	Stripping	170,000	C.Y.	0.80	136,000
4	Excavation - Borrow	2,100,000	C.Y.	0.47	987,000
5	Excavation - Earth	629,000	C.Y.	0.70	440,300
6	Excavation - Rock	629,000	C.Y.	3.50	2,201,500
7	Excavation - Trenching	58,000	C.Y.	1.00	58,000
8	Earth Embankment	2,383,000	C.Y.	0.16	381,280
9	Rock Fill	294,000	C.Y.	12.50	3,675,000
10	Filter, Sand & Gravel	52,000	C.Y.	3.00	156,000
11	Upstream Blanket	284,000	C.Y.	0.20	56,800
12	Concrete, Mass	76,500	C.Y.	22.00	1,683,000
13	Concrete, Reinforced	51,600	C.Y.	27.50	1,419,000
14	Portland Cement	147,500	BBL.	5.00	737,500
15	Re-Steel	3,100,000	LB.	0.13	403,000
16	Slide Gates	69	TON	1,200.00	82,800
17	Misc. Items		L.S.		1,255,000
	Total Dam & Reservoir				$ 13,807,180
	Contingencies @ 25% ±				3,536,820
	Total Dam & Res. Incl. Cont.				$ 17,344,000
	RELOCATIONS				
	Highway (Route 408) (1.42 mi.)		L.S.		$ 1,156,000
	Incl Cont. From N.Y.S. D.P.W.				
	Total Relocations, Incl Cont.				$ 1,156,000
	Total Project Costs				$ 18,500,000
	Government Costs				
	Engineering & Design				$ 1,900,000
	Supervision & Administration				1,600,000
	Total Govt. Costs				$ 3,500,000
	GRAND TOTAL				$ 22,000,000

PRELIMINARY

ENG FORM APR 67 1738 SUPERSEDES ENG FORM 1738, 1 APR 54, WHICH IS OBSOLETE. GPO : 1967 OF—262-653

SCALE: 1" = 2000' (APPROX.)
PHOTO TAKEN APRIL 1963

/


STATE
REFORESTATION
AREA
DAM SITE

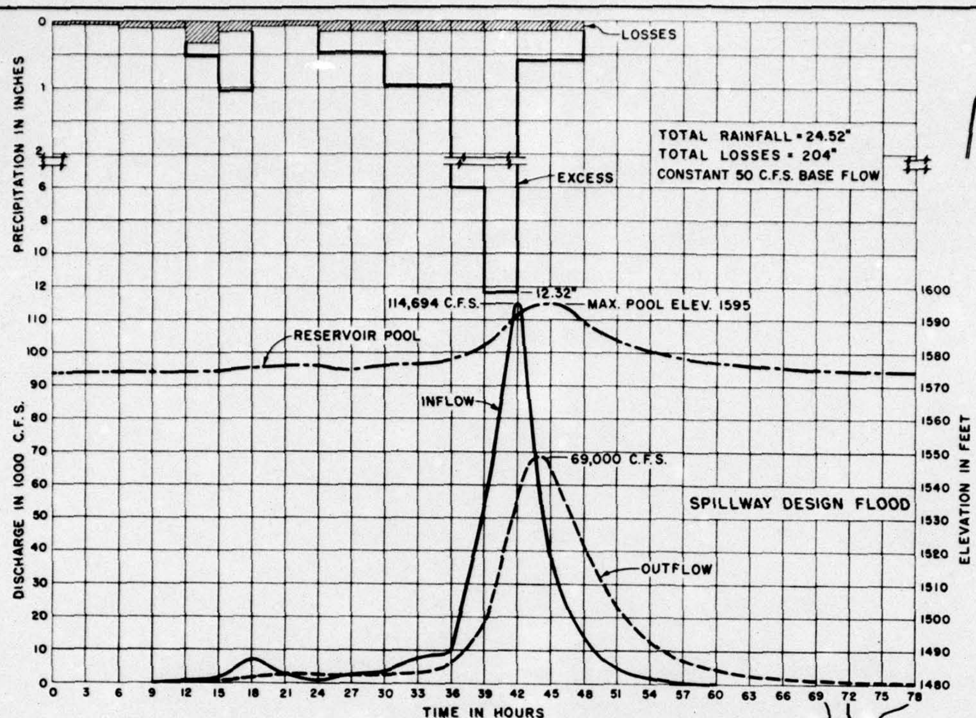
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

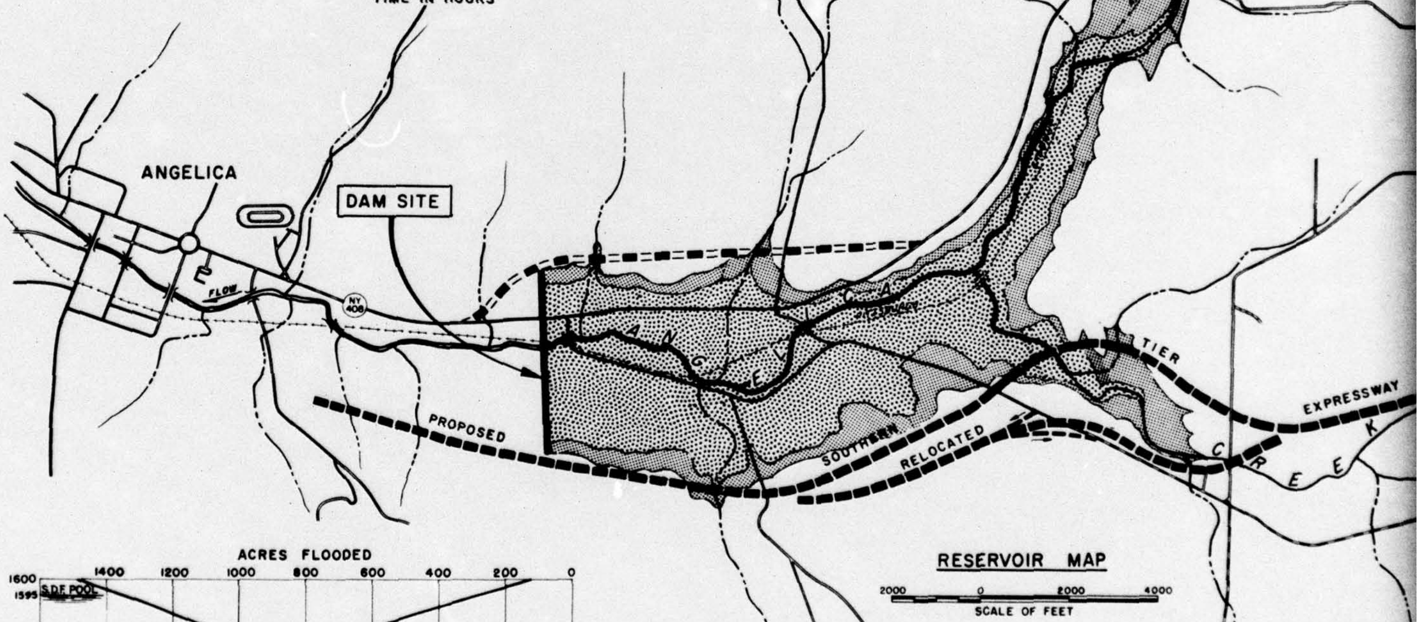
ANGELICA RESERVOIR

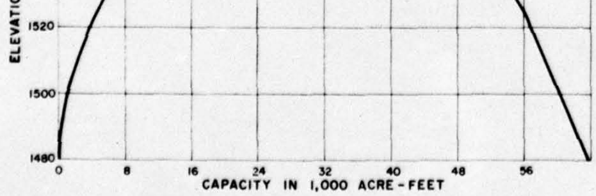
U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

3

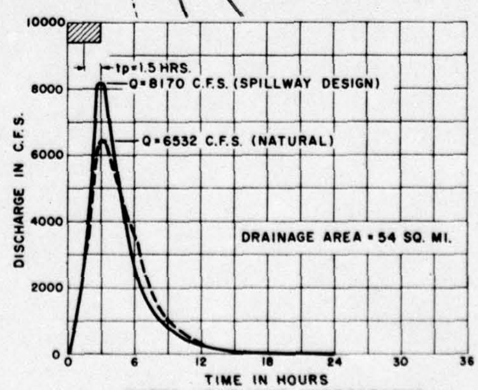
FIGURE C11



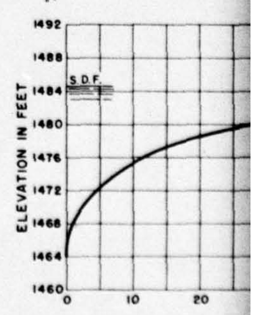




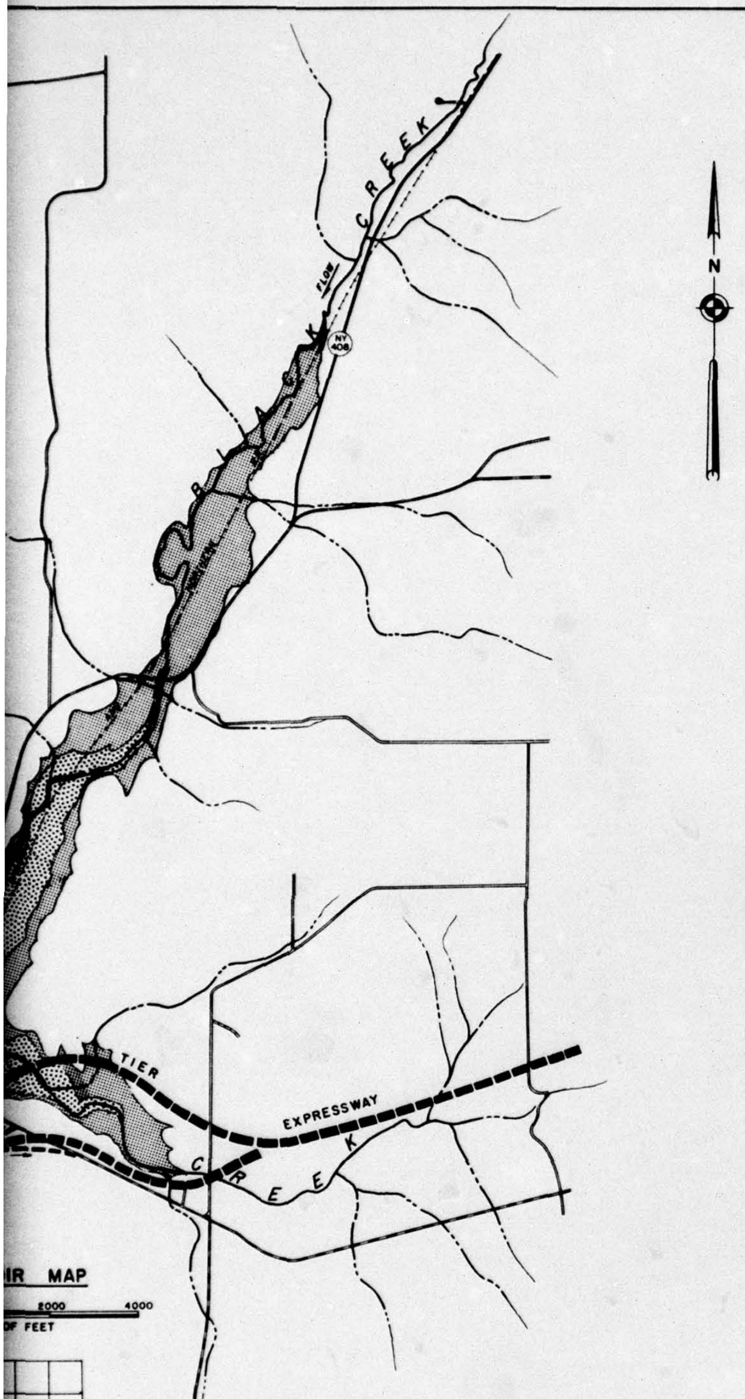
RESERVOIR AREA AND CAPACITY CURVES

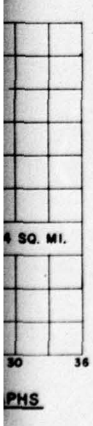


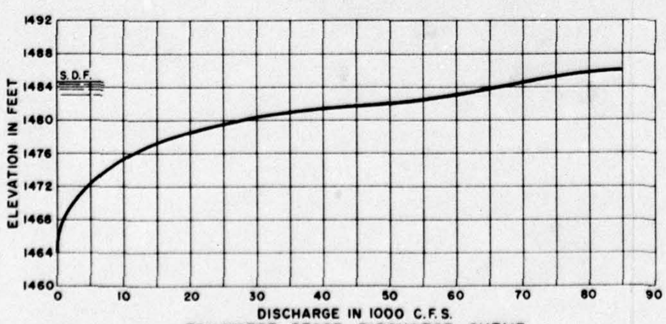
THREE-HOUR UNIT HYDROGRAPHS



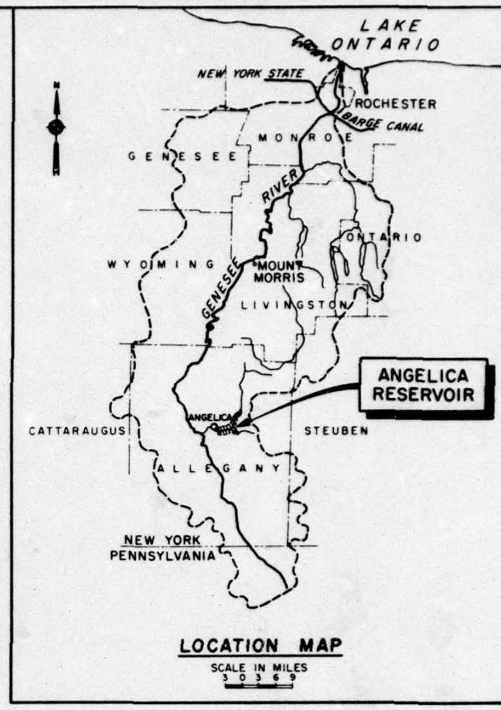
TAILWA







TAILWATER STAGE-DISCHARGE CURVE



LOCATION MAP

LEGEND:

- SPILLWAY DESIGN FLOOD POOL EL. 1595
- MAXIMUM CONSERVATION POOL EL. 1574
- HEAVY DUTY ROAD
- IMPROVED ROAD, GRAVEL
- UNIMPROVED ROAD
- RAILROAD, DISMANTLED
- PROPOSED RELOCATED MEDIUM DUTY ROAD
- SOUTHERN TIER EXPRESSWAY
- EXISTING STREAM

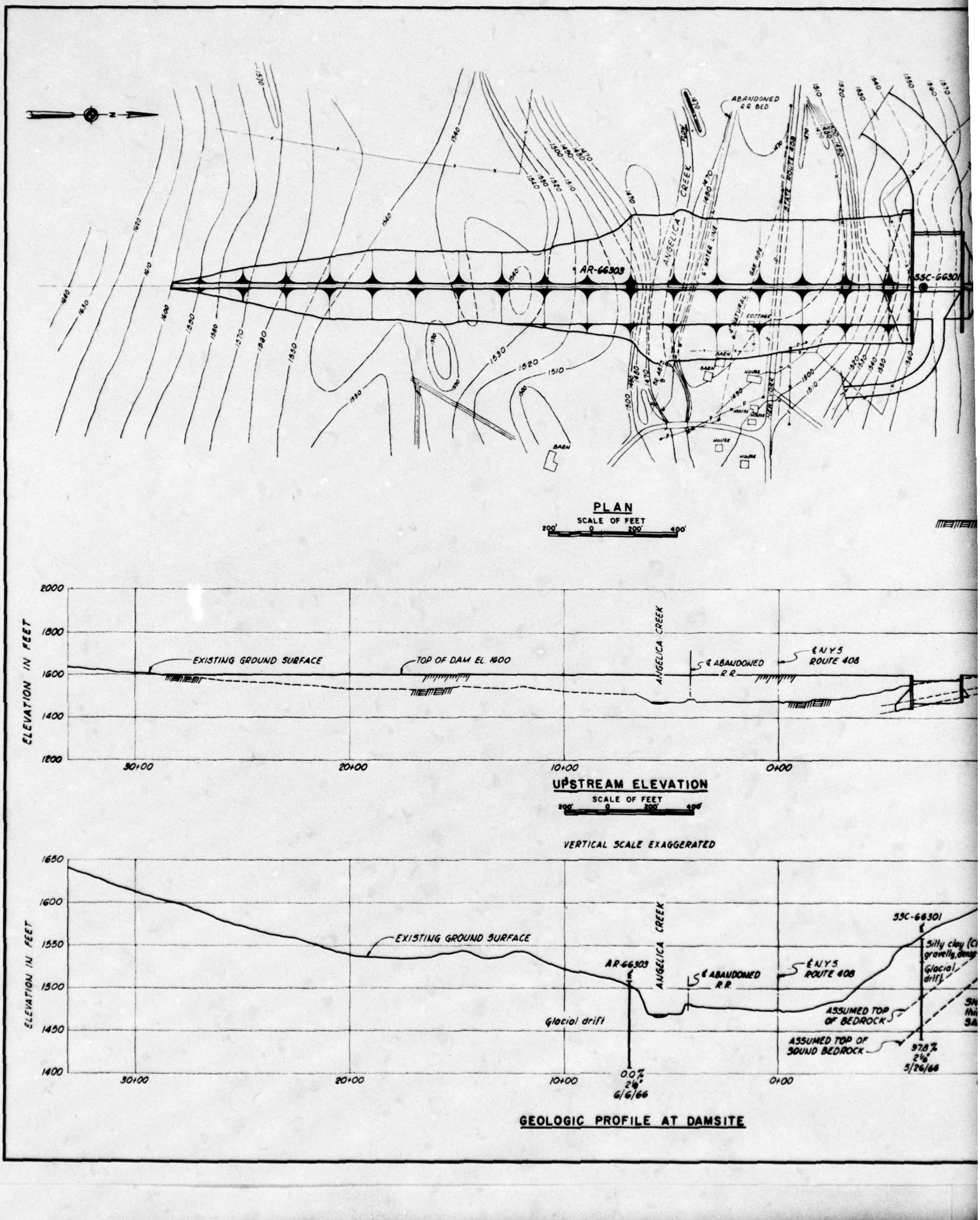
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

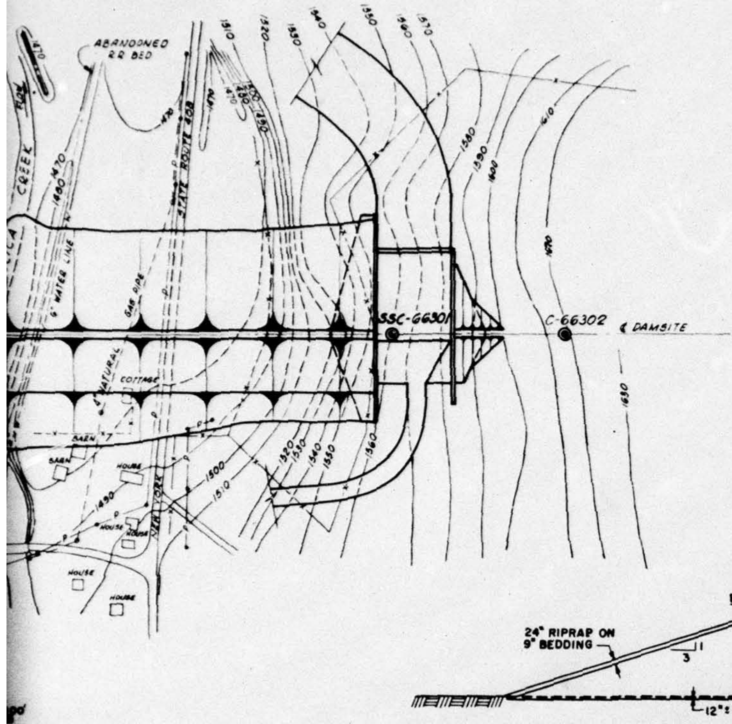
ANGELICA DAM AND RESERVOIR

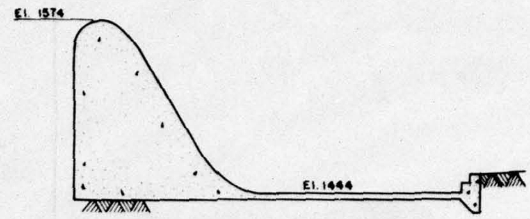
CORPS OF ENGINEERS, BUFFALO DISTRICT

JUNE 1967

FIGURE C12

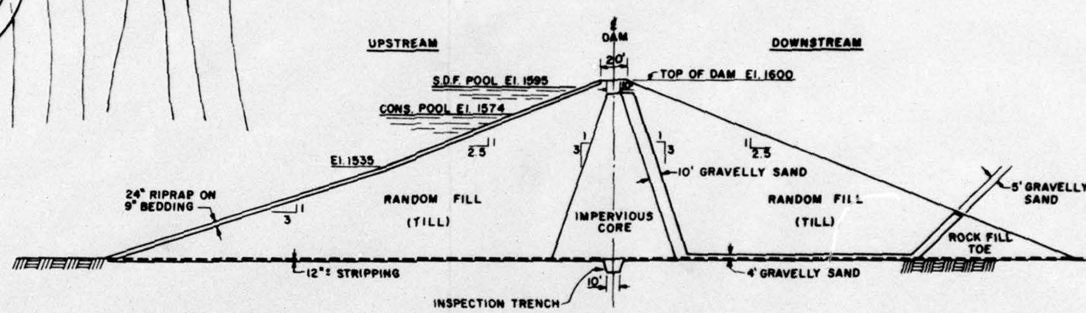

ABANDONED R.R. BED
ANGELICA CREEK
STATE ROUTE 408
AR-66303
SSC-66301
6" WATER LINE
GAS PIPE
COTTAGE
BARN
HOUSE
PLAN
SCALE OF FEET
200' 0 200' 400'
ELEVATION IN FEET
EXISTING GROUND SURFACE
TOP OF DAM EL. 1600
℄ ABANDONED R.R.
℄ N.Y.S. ROUTE 408
30+00
20+00
10+00
0+00
UPSTREAM ELEVATION
SCALE OF FEET
200' 0 200' 400'
VERTICAL SCALE EXAGGERATED
Glacial drift
ASSUMED TOP OF BEDROCK
ASSUMED TOP OF SOUND BEDROCK
0.0%
2⅛"
6/6/66
97.8%
2⅛"
5/26/66
GEOLOGIC PROFILE AT DAMSITE





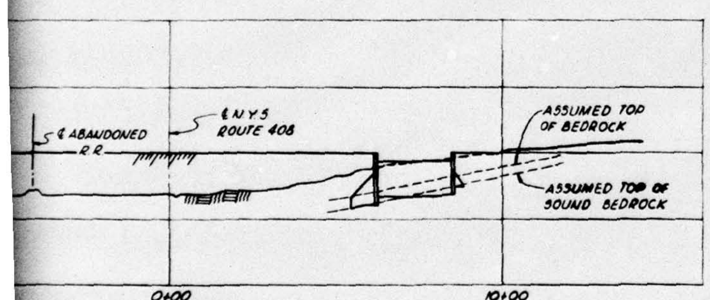
CONCRETE SPILLWAY SECTION

SCALE OF FEET



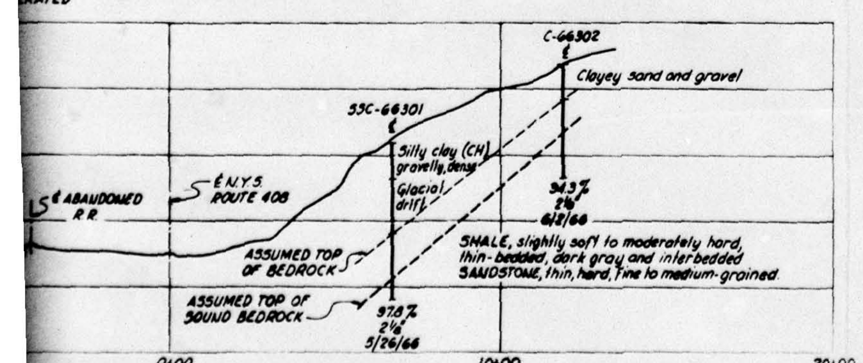
TYPICAL SECTION

SCALE OF FEET



TION

ERATED



DAMSITE

LEGEND FOR EXPLORATIONS:

HOLE NUMBER AND DESIGNATION → C-66302
*OFFSET → ℄
TOP OF HOLE →
ASSUMED TOP OF BEDROCK →
BOTTOM OF HOLE →
PERCENT CORE RECOVERED IN BEDROCK → 94.3%
DIAMETER OF BEDROCK CORE → 2 1/8"
DATE EXPLORATION COMPLETED → 6/2/66

TYPE OF EXPLORATION CODE DESIGNATION

C	CORE HOLE
AR	AUGER AND/OR ROCKBIT HOLE
SS	SPLIT SPOON SAMPLE
●	VERTICAL EXPLORATION

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

ANGELICA DAM
PLAN AND DETAILS

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE C13

GENESEE RIVER BASIN COMPREHENSIVE STUDY

APPENDIX "C"

SECTION III - OTHER RESERVOIR PROJECTS STUDIED

1. GENERAL

Ten of the fourteen reservoirs included in the comprehensive study were considered as phase I sites and were screened out of further study because of either engineering or economic reasons. Primarily these sites lacked adequate flood control storage and sufficient volumes for other development possibilities, such as water quality, power and irrigation. The evaluation of the phase I sites was based on criteria recommended by the Corps of Engineers. This section contains the preliminary design and cost estimate for each of the ten phase I sites.

2. There were no subsurface explorations made at any of the sites which are discussed below. Four methods of obtaining geologic data were employed:

a. Windshield survey, with frequent stops to take photos.

b. Pedestrian traverse, observing and noting outcrops of bedrock and till deposits.

c. Examination of logs of existing oil wells.

d. Geologic library research of pamphlets and reports.

Depths to top of bedrock, where noted, were based on field reconnaissance and review of available geologic information and in many cases are merely estimated depths and may vary appreciably from depths shown. Sources of concrete aggregate and riprap which in the past have been approved by the Corps of Engineers are quarries at Le Roy, Rochester and Buffalo, New York. A quarry at Stafford, New York is also a potential source, although it has not been on the approved list. A quarry near State College, Pennsylvania, supplied aggregate for the Allegheny Dam project. This source is about 90 miles south of Wellsville, New York and can be considered a potential source of materials for the Chenunda and Vandermark sites.

3. Designs were made using general principles of accepted design practices described in engineering manuals of the Corps of Engineers together with design criteria and basic data described in this appendix. Quantities for the structure were determined from generalized curves of typical structures.

4. In the development of the spillway design flood, the unit-hydrograph for each drainage area, with the exception of Black Creek and Rush Creek areas, were increased 50 percent. The unit-hydrograph for Black and Rush Creeks were increased 25 percent. It was considered that a five-foot freeboard would be a sufficient allowance for wind tide and wave runup. Although all of the reservoirs did not meet this criteria exactly, they were considered adequate for this stage of design. Table C4 is a summary of the ten phase I reservoirs showing the capacity and benefit - cost ratio of each reservoir. It should be noted that the benefit - cost ratio shown was obtained by using the maximum potential single purpose average annual benefits and that maximum average annual benefits could not be obtained in each catagory simultaneously. Therefore, the actual benefit - cost ratio in each case would be less than is shown in table C4. Although the Summit and Oatka sites were rejected by Corps criteria, their benefit - cost ratios indicate that they could be a feasible site for an agency that was allowed to use total Recreation and Fish and Wildlife benefits.

TABLE C4. - Other reservoir projects studied

No.	Site	Stream	D.A. (Sq. Mi.)	Total Storage (Ac.-Ft)	Dead (1) Storage (Ac.-Ft)	Active Storage (Ac.-Ft)	Costs ($1000) First Dam & Relocat.	Real Estate	Total Invest.	Average Annual	Acre Ft. Storage	Maximum Potential Single Purpose Average Annual Benefits ($1000) (2) Flood Control	(3) Irri-gation	(4) Recre-ation	(5) Fish & Wildlife	(6) Hydro-Power	Total Benefits ($1000)	Benefit Cost Ratio
2	Chenunda	Chenunda	29	20,000	400	19,600	13,000	460	14,100	511	.719	10.9	20.1	1.7	138.5	5.0	176.2	.34
3	Vandermark	Vandermark	20	20,200	300	19,900	8,700	140	9,300	343	.467	1.0	15.9	1.9	130.0	2.0	150.8	.44
5	Summit	Black	20	20,000	1,000	19,000	4,900	110	5,200	189	.274	4.2	7.2	3.5	508.0	0	522.9	2.77
7	Cold	Cold	40	23,800	700	23,100	14,500	230	15,600	566	.675	.5	4.8	3.1	140.0	6.0	154.4	.27
8	Rush	Rush	39	18,600	600	18,000	16,800	105	18,000	643	1.000	.6	4.8	1.4	170.0	4.0	180.8	.28
9	Wiscoy	Wiscoy	108	43,200	500	42,700	14,800	250	16,000	578	.375	3.5	2.4	1.8	90.0	22.0	119.7	.21
11	Tuscarora	Keshequa	68	46,000	2,300	43,500	15,900	589	17,000	586	.390	16.5	0	-	350.0	7.0	373.5	.64
12	Poag's Hole	Canaseraga	89	56,000	3,000	53,000	30,000	215	32,100	1,120	.606	30.4	6.9	-	198.0	26.0	261.3	.23
13	Honeoye	Honeoye	189	13,600	800	12,800	8,300	250	9,000	331	.703	0	12.3	6.7	-	0	19.0	.06
14	Oatka	Oatka	161	44,500	800	43,700	14,700	640	16,300	588	.373	4.4	0	301.3	217.0	7.0	529.7	.90

(1) Estimated 100-year sediment pool

(2) Max. benefits from App. F

(3) From preliminary data furnished by SCS

(4) Net benefits from B.O.R. working draft

(5) Gross benefits from App. N

(6) Net benefits from App. L (Difference between Specific Power Cost & benefits based on Private Financing of Steam Plant as Alternative at $18/kw)

CHENUNDA CREEK RESERVOIR

5. LOCATION

The Chenunda dam site is located on Chenunda Creek in Allegany County, New York, approximately 1.4 miles upstream from the confluence with the Genesee River and 0.7 miles east of Stannards Corners, New York.

6. PERTINENT DATA

1.	Maximum W.S. elev. (Spillway design flood pool)	1695
2.	Maximum topography, ft.	1750
3.	Conservation pool, ft.	1668
4.	Flood control pool, ft.	1690
5.	Pool area at maximum W.S., Ac.	510
6.	Pool area at conservation pool, Ac.	335
7.	Pool area at flood control pool, Ac.	485
8.	Channel elev. at toe of dam	1572
9.	Total capacity at flood control pool, Ac. ft.	20,000
10.	Total capacity at Conservation pool, Ac. ft.	11,000
11.	Total capacity at flood control pool, in.	13.3
	DAM	
12.	Top of dam, elev.	1700
13.	Top width, ft.	20
14.	Height above streambed. ft.	128
15.	Length, ft.	2000
	SPILLWAY	
16.	No. of gates	5
17.	Size of gates, ft	40 X 13
18.	Top of gates, elev.	1690
19.	Crest elev.	1677
20.	Length (effective), ft.	200
21.	Maximum head on crest (design), ft.	18
22.	Design discharge, cfs	50,500
	OUTLET WORKS	
23.	No. of conduits	2
24.	Size of each conduit, $ft.^2$	10
	STILLING BASIN	
25.	Length, ft.	85
26.	Bottom width, ft. (based on assumed pier width)	232
27.	Elev. of bottom	1562
28.	Elev. of end sill	1572

7. HYDRAULIC DESIGN

The maximum probable storm was used as a spillway design storm. This storm was developed from the all-season envelope in the U.S. Weather Bureau Report No. 33. The rainfall distribution was arranged in accordance with EM 1110-2-1405, Corps of Engineers. For a drainage area of 29 square miles, the peak discharge from a maximum probable flood would be 67,200 cfs. After being routed through the reservoir, the M.P.F produced a spillway design discharge of 50,500 cfs. The controlled concrete spillway would be an ogee-shaped weir with a vertical upstream face. The stilling basin would be rectangular in cross section. The outlet works would be designed for a discharge of 350 cfs under conservation pool conditions (elev. 1668). This flow allows a reasonable reservoir draining time but does not exceed bank-full conditions downstream.

8. SUBSURFACE INVESTIGATIONS AND FOUNDATION CONDITIONS

The overburden at the abutments of the proposed damsite consists of about 20 to 30 feet of glacial drift overlying interbedded silts and clays. The depth of overburden in the valley section is not known but data on oil well logs indicate it to be extensive. The creek bed is heavily paved with gravel, cobbles and boulders. Random and impervious fill is available in the general area of the site, as is bedding material. Estimated depths to top of bedrock; left abutment, 50 ft., valley, 100+ ft., right abutment, 35 ft.

9. DESIGN DETAILS

The proposed rolled earth embankment would have a crest length of approximately 2000 feet and would rise about 128 feet above the valley floor. The crown width at top elevation of 1700 would be 20 feet. Both the upstream and downstream slopes of the earth embankment would be 1V on 2.5H. Embankment material would be obtained from valley soils. The concrete spillway would be regulated by five radial gates which would be 13 feet high by 40 feet long and would be supported by four center piers, 8 feet wide. The stilling basin would be founded on rock. The outlet works would consist of two conduits, each controlled by two slide gates. One gate would be in reserve for emergency closure.

10. RELOCATIONS

The reservoir would necessitate the relocation of 3 miles of light duty road. See figure C14.

11. LAND REQUIREMENTS

Estimated land requirements for the reservoir at S.D.F. elevation and conservation pool elevation are 510 acres and 335 acres respectively. During the time of the 1965 survey, the reservoir at both S.D.F elevation and conservation pool elevation would require the acquisition of 29 houses and 3 farm units. The reservoir location is shown in figure C14.

12. CONCLUSIONS

The Chenunda site was not included in the basin development plans because of the high cost of storage as compared to the recommended sites. The high cost of storage is mainly due to excessive common and rock excavation for the spillway and stilling basin at the right abutment. The relatively small benefits except for Fish and Wildlife made the Chenunda site an unattractive possibility for basin development.

13. COST ESTIMATES

This cost estimate is of a preliminary nature and is to be used for informational purposes only.

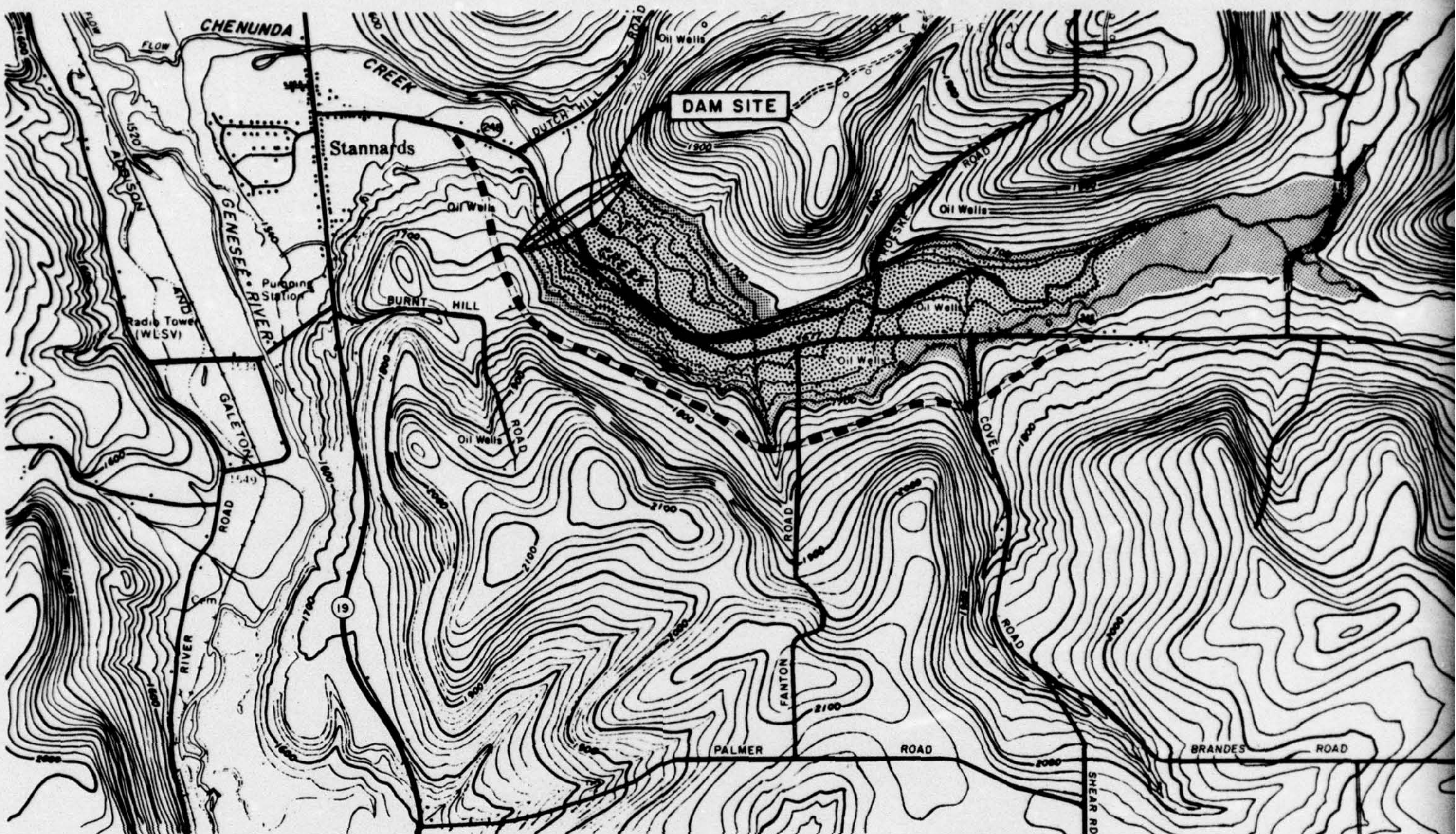
REASONABLE CONTRACT ESTIMATE

SHEET OF

PROJECT: CHENUNDA CREEK RES. - MULTIPLE PURPOSE (PRELIMINARY)

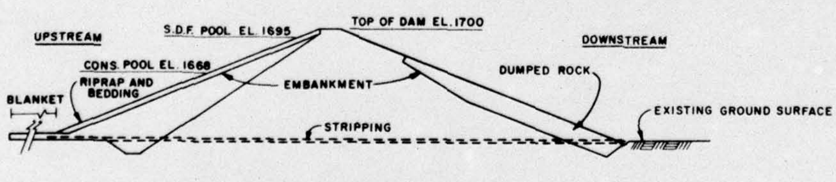
INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	DAM & RESERVOIR				
1	Clearing	70	Ac	$250.00	$ 20,000
2	Stripping	201,000	CY	0.80	160,800
3	Common Excavation	714,000	CY	0.70	499,800
4	Rock Excavation	200,000	CY	3.50	700,000
5	Borrow Excavation	1,400,000	CY	0.50	700,000
6	Earth Embankment	1,670,000	CY	0.16	267,200
7	Rock Fill	189,000	CY	1.70	321,300
8	Filter Sand & Gravel	27,000	CY	3.00	81,000
9	Upstream Blanket	166,000	CY	0.16	26,560
10	Concrete, Mass	126,000	CY	20.50	2,583,000
11	Concrete, Reinforced	29,300	CY	32.50	952,250
12	Portland Cement	155,000	Bbl	5.00	775,000
13	Reinforcing Steel	1,800,000	#	0.16	288,000
14	Radial Gate & Hoists	35	T	2200.00	77,000
15	Slide Gates	20	T	1500.00	30,000
16	Spillway Bridge	4,700	SF	25.00	117,500
17	Control House		L.S.		10,000
18	Electrical Work		L.S.		20,000
19	Cofferdam & Care of Water		L.S.		50,000
20	Misc. Items 10% (item 1-19)		L.S.		760,000
	TOTAL DAM & RESERVOIR				8,439,350
	Contingencies @ 25% ±				2,060,650
	TOTAL DAM & RESERVOIR COSTS INC. CONT.				$10,500,000
	RELOCATIONS				
1	Highway - Light Duty	3	M.	200,000	600,000
	TOTAL RELOCATIONS				600,000
	Contingencies				200,000
	TOTAL RELOCATIONS INC. CONTINGENCIES				$ 800,000
	TOTAL PROJECT COSTS				$11,300,000
	GOV'T COSTS				
	Engineering & Design				900,000
	Supervision & Administration				800,000
	TOTAL GOV'T COSTS				1,700,000
	GRAND TOTAL				$13,000,000
	No Page III - C8				



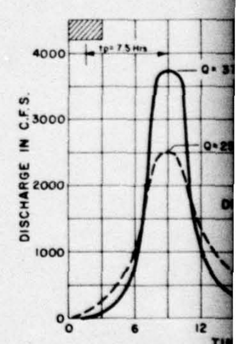
PLAN

SCALE OF FEET
1000' 0 1000' 2000'

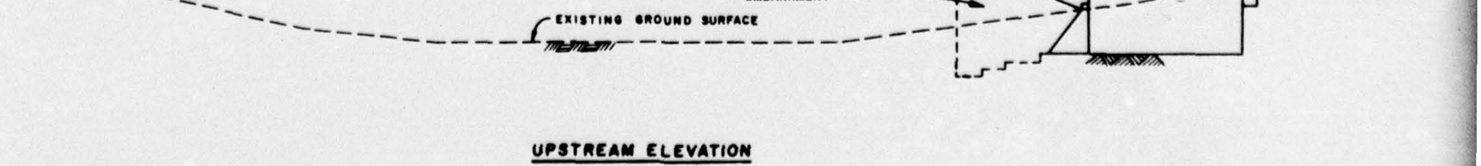


TYPICAL SECTION OF EMBANKMENT

SCALE OF FEET
50' 0 50' 100'

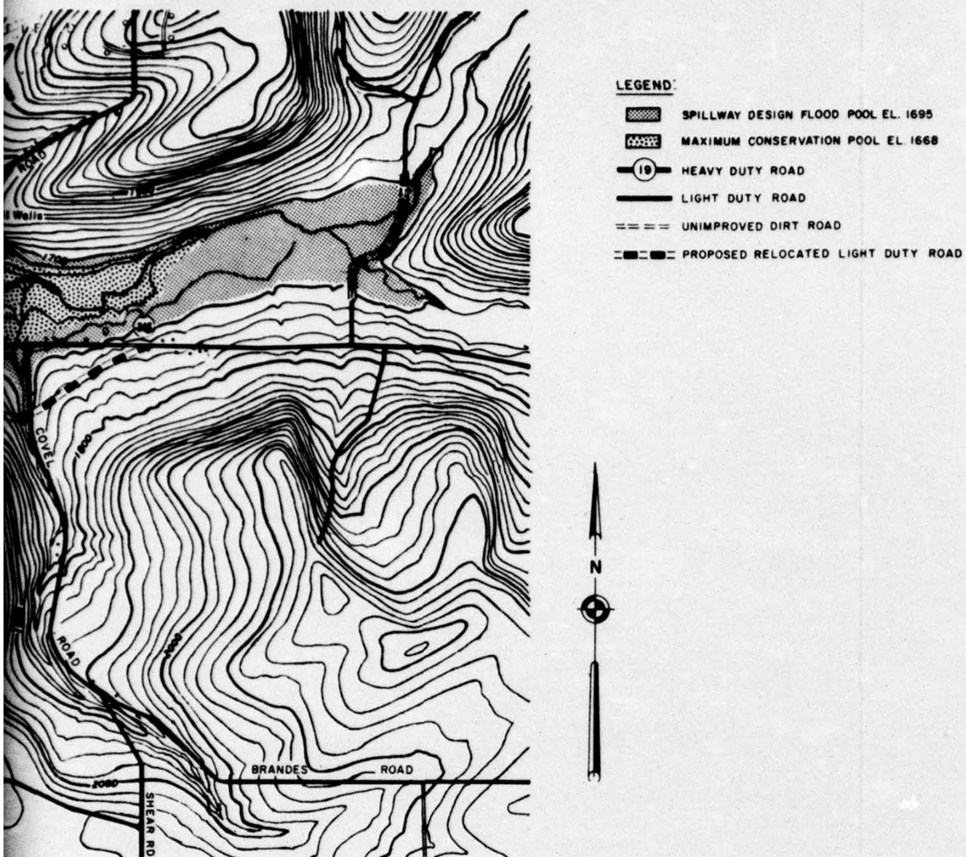


THREE-HOUR



UPSTREAM ELEVATION

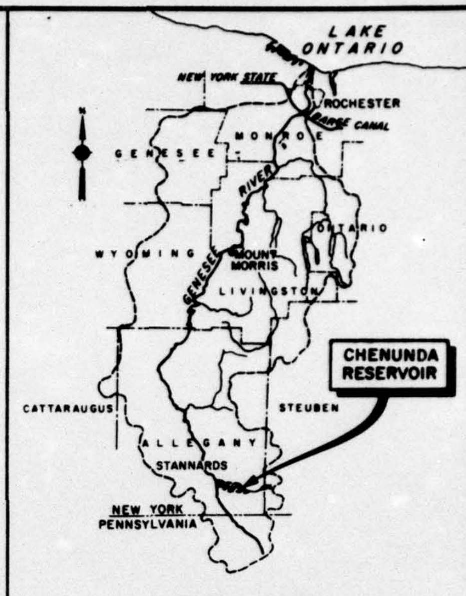
SCALE OF FEET
100' 0 100' 200'



LAN

E OF FEET

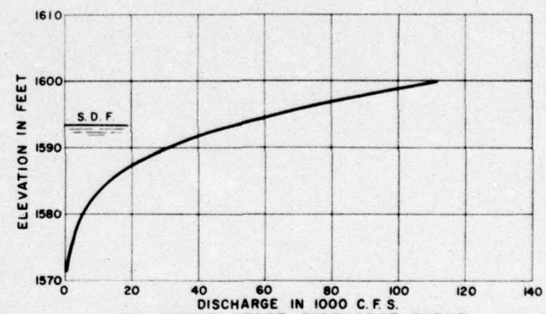
1000' 2000'



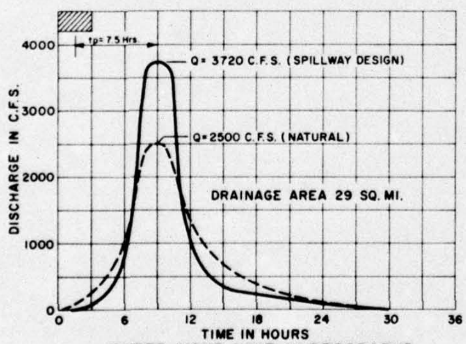
LOCATION MAP

SCALE IN MILES

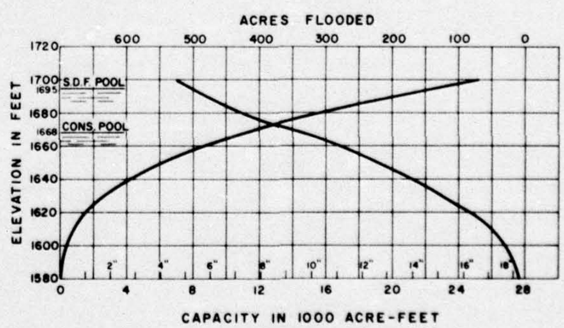
3 0 3 6 9



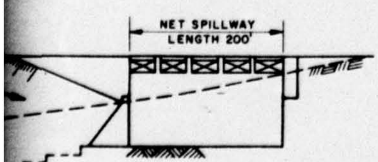
TAILWATER STAGE-DISCHARGE CURVE

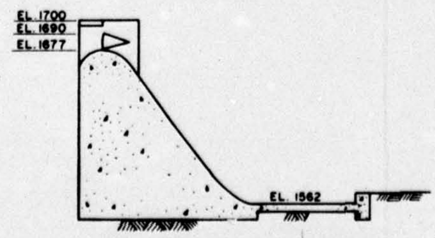


THREE-HOUR UNIT HYDROGRAPHS



RESERVOIR AREA AND CAPACITY CURVES





CONCRETE SPILLWAY SECTION

SCALE OF FEET

50' 0 50' 100'

GENESEE RIVER BASIN

COMPREHENSIVE STUDY

NEW YORK AND PENNSYLVANIA

CHENUNDA CREEK DAM AND RESERVOIR

U. S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE C14

VANDERMARK CREEK RESERVOIR

14. LOCATION

The Vandermark dam site is located on Vandermark Creek in Allegany County, New York, approximately 2.1 miles upstream from the confluence with the Genesee River and approximately 2.0 miles east of Scio, New York.

15. PERTINENT DATA

RESERVOIR		
1.	Maximum W.S. elev. (Spillway design flood pool)	1697
2.	Maximum topography, ft.	1720
3.	Conservation pool, ft.	1675
4.	Flood control pool, ft.	1690
5.	Pool area at maximum W.S., Ac.	525
6.	Pool area at conservation pool, Ac.	365
7.	Pool area at flood control pool, Ac.	470
8.	Channel elevation at toe of dam.	1579
9.	Total capacity at flood control pool, Ac. ft.	20,200
10.	Total capacity at conservation pool, Ac. ft	13,800
11.	Total capacity at flood control pool, in.	18.5
DAM		
12.	Top of dam, elev.	1700
13.	Top width, ft.	20
14.	Height above streambed, ft.	121
15.	Length, ft.	1550
SPILLWAY		
16.	No. of gates	3
17.	Size of gates, ft.	42 x 15
18.	Top of gates, elev.	1690
19.	Crest elev.	1675
20.	Length (effective), ft.	125
21.	Maximum head on crest (design), ft.	22
22.	Design discharge, cfs	41,000
OUTLET WORKS		
23.	No. of conduits	2
24.	Size of each conduit, $ft.^2$	10
STILLING BASIN		
25.	Length, ft.	150
26.	Bottom width, ft. (based on assumed pier width)	141
27.	Elev. of bottom	1569
28.	Elev. of end sill	1579

16. HYDRAULIC DESIGN

The maximum probable storm was used as a spillway design storm. This storm was developed from the all-season envelope in the U.S. Weather Bureau Report No. 33. The rainfall distribution was arranged in accordance with EM 1110-2-1405, Corps of Engineers. For a drainage area of 20 square miles, the peak discharge from a maximum probable flood would be 59,600 cfs. After being routed through the reservoir, the M.P.F. produced a spillway design discharge of 41,000 cfs. The gated concrete spillway would be an ogee-shaped weir with a vertical upstream face. The stilling basin would be rectangular in cross section. The outlet works would be designed for a discharge of 475 cfs under conservation pool conditions (elev. 1675). This flow would allow a reasonable reservoir draining time but it would not exceed bank-full conditions downstream.

17. SUBSURFACE INVESTIGATIONS AND FOUNDATION CONDITIONS

The overburden at this site consists of a very shallow cover of glacial drift. Bedrock is exposed at both abutments and in the pool area, consists mainly of silty sands of undetermined depth. Random and impervious fill and bedding material can be obtained locally. Estimated depths to top of bedrock: left abutment, 15 ft., valley, 5 ft., right abutment, 15 ft.

18. DESIGN DETAILS

The proposed rolled-earth embankment would have a crest length of approximately 1550 feet and would rise about 121 feet above the valley floor. The crown width at top elevation of 1700 would be 20 feet. Both the upstream and downstream slopes of the earth embankment would be 1V on 2.5H. It is assumed that embankment material would be obtained from valley soils. The concrete spillway would be regulated by three radial gates which would be 15 feet high by 42 feet long and would be supported by two center piers 7.5 feet wide. The stilling basin would be founded on rock and would have a 5-foot thick apron. The outlet works would consist of two conduits each controlled by two slide gates. One gate would be in reserve for emergency closure.

19. RELOCATIONS

The reservoir would necessitate the relocation of 4.5 miles of medium duty road. See figure C15.

20. LAND REQUIREMENTS

Estimated land requirements for the reservoir at S.D.F. elevation and conservation pool elevation are 515 acres and 365 acres respectively. During the time of the 1965 survey, the reservoir at both S.D.F. elevation and conservation pool elevation would require the acquisition of 8 houses and 4 farm units. The reservoir location is shown on figure C15.

21. CONCLUSIONS

The Vandermark Creek site was not included in the basin development plans because of its unfavorable benefit - cost ratio. The high cost of relocations, negligible flood benefits and no possibilities for power development were the major reasons for the low B/C ratio.

22. COST ESTIMATES

This cost estimate is of a preliminary nature and is to be used for information purposes only.

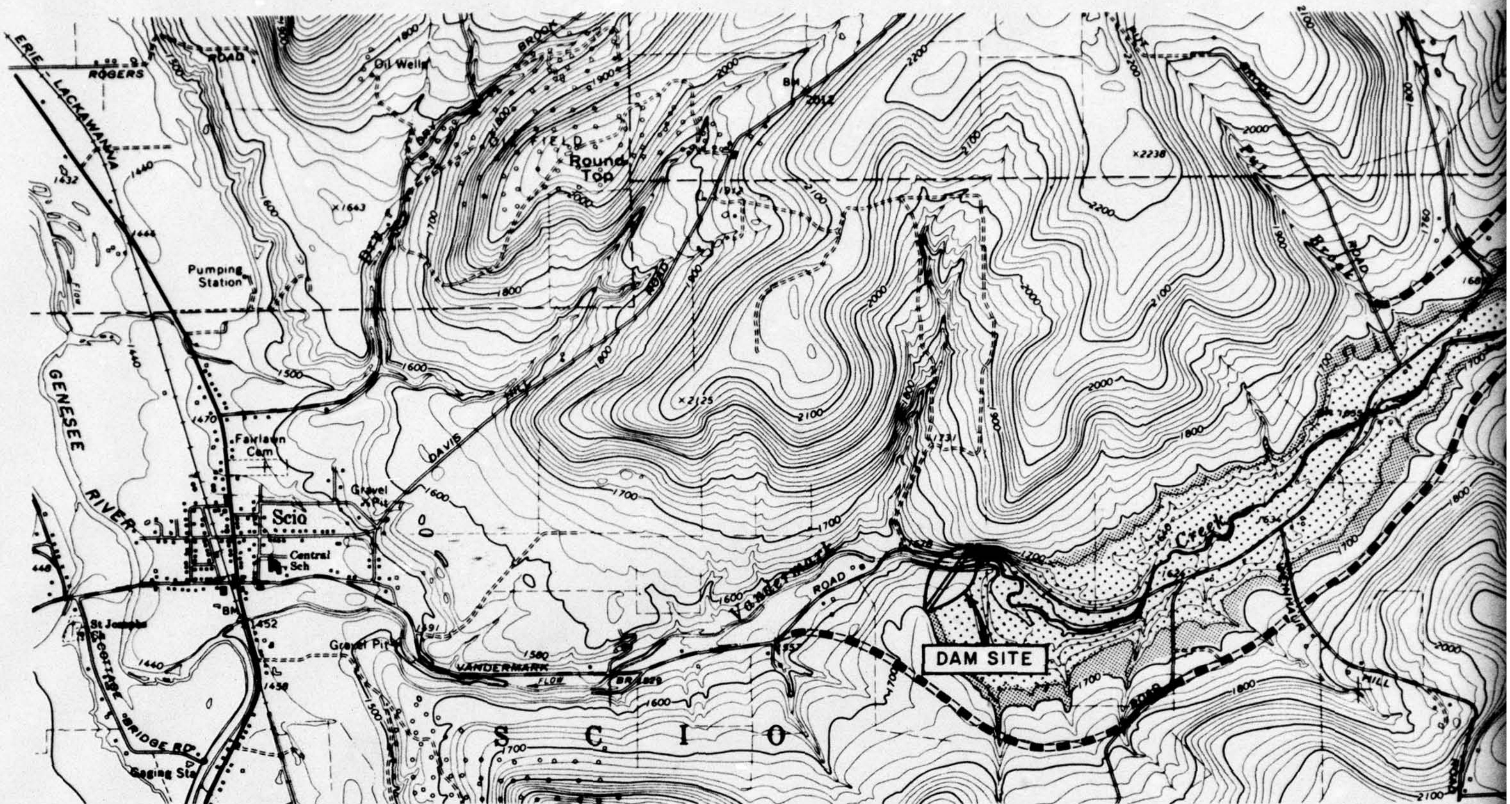
REASONABLE CONTRACT ESTIMATE

SHEET OF

PROJECT: VANDERMARK CREEK RESERVOIR - MULTIPLE PURPOSE (PRELIMINARY)

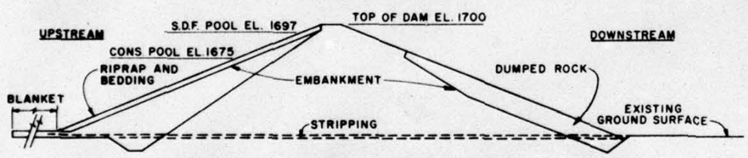
INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	DAM & RESERVOIR				
1	Clearing	180	Ac	$ 200.00	$ 36,000
2	Stripping	64,000	CY	0.95	60,800
3	Common Excavation	142,000	CY	0.32	116,440
4	Rock Excavation	53,500	CY	3.70	197,950
5	Borrow Excavation	220,000	CY	0.65	143,000
6	Earth Embankment	232,000	CY	0.35	81,200
7	Rock Fill	37,000	CY	5.00	185,000
8	Filter Sand & Gravel	7,600	CY	3.00	22,800
9	Upstream Blanket	75,000	CY	0.35	26,250
10	Concrete, Mass	102,000	CY	21.00	2,142,000
11	Concrete, Reinforced	12,000	CY	41.00	492,000
12	Portland Cement	120,000	Bbl	5.00	600,000
13	Reinforcing Steel	750,000	#	0.16	120,000
14	Radial Gates & Hoists	84	Ton	2200.00	184,800
15	Slide Gates	22	Ton	1500.00	33,000
16	Spillway Bridge	2,800	SF	25.00	70,000
17	Control House		LS		10,000
18	Electrical Work		LS		20,000
19	Cofferdam & Care of Water		LS		50,000
20	Misc. Items		LS		460,000
	TOTAL DAM & RESERVOIR				5,051,240
	Contingencies @ 25%				1,248,760
	TOTAL DAM & RESERVOIR INC. CONT.				$ 6,300,000
	RELOCATIONS				
1	Highway - Light Duty	4.5	Mi.	200,000	900,000
	TOTAL RELOCATIONS				900,000
	Contingencies @ 25% ±				200,000
	TOTAL RELOCATIONS				1,100,000
	TOTAL PROJECT COSTS				$ 7,400,000
	GOV'T COSTS				
	Engineering & Design				700,000
	Supervision & Administration				600,000
	TOTAL GOV'T COSTS				1,300,000
	GRAND TOTAL				$ 8,700,000



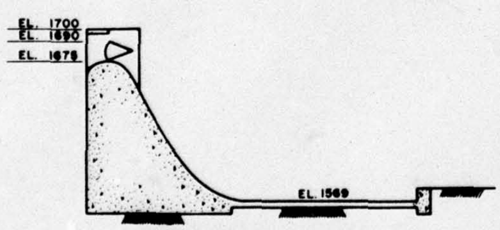
PLAN

SCALE OF FEET



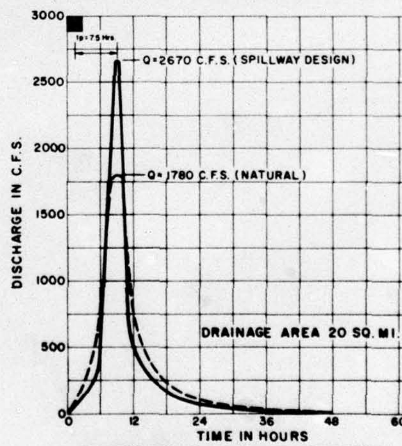
TYPICAL SECTION OF EMBANKMENT

SCALE OF FEET

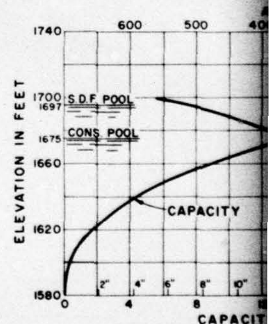


CONCRETE SPILLWAY SECTION

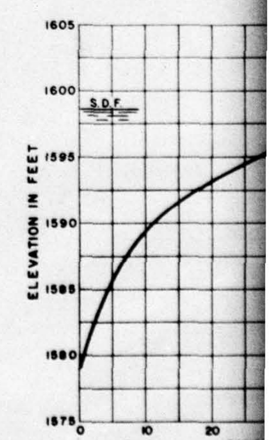
SCALE OF FEET



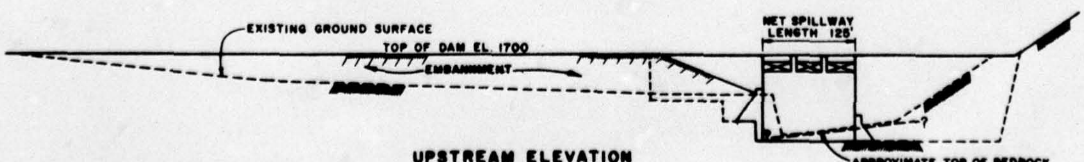
THREE-HOUR UNIT HYDROGRAPHS



RESERVOIR AR

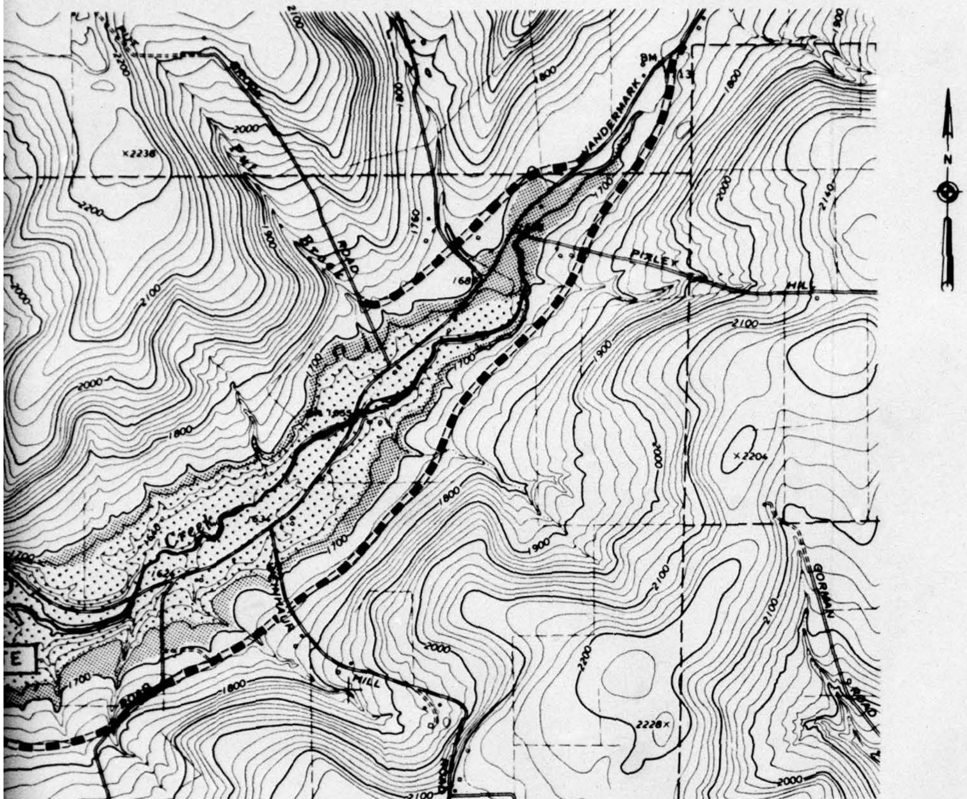


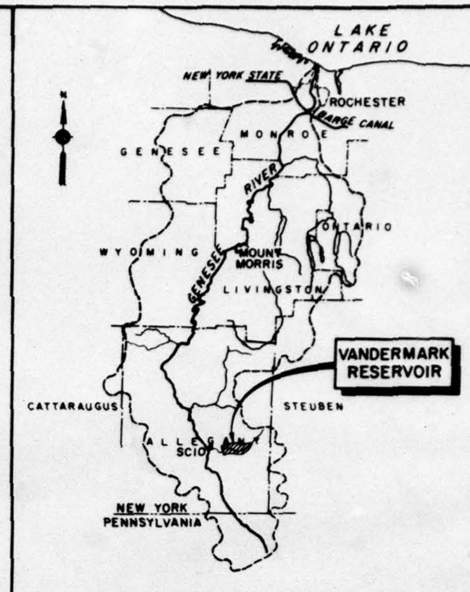
TAILWATER STA



UPSTREAM ELEVATION

SCALE OF FEET

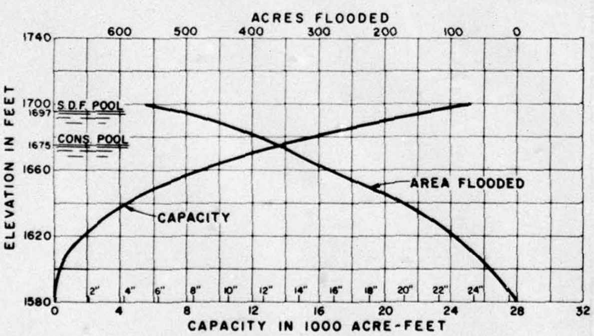




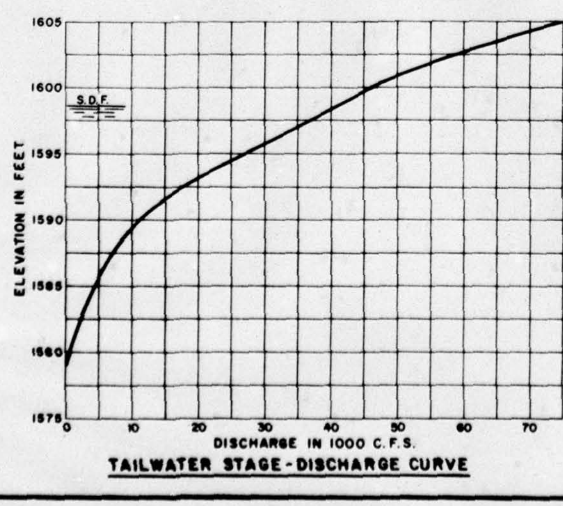
LOCATION MAP

SCALE IN MILES

YDROGRAPHS



RESERVOIR AREA AND CAPACITY CURVES



TAILWATER STAGE-DISCHARGE CURVE

LEGEND:

- SPILLWAY DESIGN FLOOD POOL EL. 1697
- MAXIMUM CONSERVATION POOL EL. 1675
- HEAVY DUTY ROAD
- MEDIUM DUTY ROAD
- LIGHT DUTY ROAD
- UNIMPROVED DIRT ROAD
- PROPOSED RELOCATED MEDIUM DUTY ROAD

GENESEE RIVER BASIN

COMPREHENSIVE STUDY

NEW YORK AND PENNSYLVANIA

VANDERMARK CREEK, DAM AND RESERVOIR

U. S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE C15

SUMMIT RESERVOIR

23. LOCATION

The Summit dam site is located on Black Creek in Allegany County, New York, approximately 0.6 of a mile upstream from Birdsall, New York.

24. PERTINENT DATA

RESERVOIR	
1. Maximum W.S. elev. (Spillway design flood pool)	1715
2. Maximum topography, ft.	1720
3. Conservation pool, ft.	1700
4. Pool area at maximum W.S. Ac.	1950
5. Pool area at conservation pool, Ac.	1400
6. Channel elevation at toe of dam	1666
7. Total capacity at conservation pool, Ac. ft.	20,000
8. Total capacity at conservation pool, in.	18
DAM	
9. Top of dam, elev.	1720
10. Top width, ft.	20
11. Height above streambed, ft.	54
12. Length, ft.	1460
SPILLWAY	
13. Crest elev.	1700
14. Diameter of crest, ft. (Morning glory)	19.5
15. Diameter of throat, ft.	9.8
16. Maximum head on crest (design), ft.	15
17. Design discharge,cfs	3220
OUTLET WORKS	
18. No. of conduits	1
19. Size, ft.^{2}	20
STILLING BASIN	
20. Length, ft.	60
21. Bottom width, ft.	40
22. Elev. of bottom	1666
23. Elev. of end sill	1671

25. HYDRAULIC DESIGN

The maximum probable storm was used as a spillway design storm. This storm was developed from the all-season envelope in the U.S. Weather Bureau Report No. 33. The rainfall distribution was arranged in accordance with EM 1110-2-1405, Corps of Engineers. For the drainage area of 20 square miles, the peak discharge from a maximum probable flood would be 67,600 cfs. After being routed through the reservoir, the M.P.F. produced a spillway design discharge of 3220 cfs. Due to the small drainage area involved and due to the relatively large volume of water stored, it was decided to limit the design to a reservoir controlled by a morning glory spillway in order to utilize the maximum possible storage for other purposes. The crest elevation would be set at such an elevation that would permit the water surface elevation of the design flood to rise to elevation 1715. To contain the spillway design flood within the reservoir area, two dikes would be required with crests at elevation 1720. One dike, 2000 feet in length, would cross Fink Hollow Road at the western extremity of the reservoir. The other dike, 200 feet long, is located in the vicinity of Dieter Road at the eastern extremity of the reservoir. See figure C16. The spillway would be capable of discharging the design flood in 10 days. The outlet works would be designed for a discharge of 650 cfs under conservation pool conditions (elev. 1700). For a dam of this type, the outlet works would be primarily for reservoir drainage or if for some reason the reservoir pool was to be kept at less than conservation pool, a natural flow could be maintained downstream.

26. SUBSURFACE INVESTIGATIONS AND FOUNDATION CONDITIONS

At this site, Black Creek meanders through a thickly brushed, wet marsh area. The right abutment rises sharply to the crest elevation while the left abutment rises in a series of benches. Both abutments are thickly wooded and it appears that the overburden consists of glacial drift with numerous cobbles and boulders. Leakage through the abutments is a definite possibility. An ample supply of random fill and bedding materials is available from the numerous sand and gravel pits in the immediate area of the site and impervious fill can be obtained in the general vicinity. Estimated depths to top of bedrock; left abutment, 35 ft., valley, 50 ft., right abutment, 50 ft.

27. DESIGN DETAILS

The proposed rolled earth embankment would have a crest length of approximately 1460 feet and would rise about 54 feet above the valley floor. The width at top elevation of 1720 would be 20 feet. Both the upstream and downstream slopes of the earth embankment would be IV on 2.5H. The 2200 feet of dikes would have a crest width of 10 feet and side slopes of IV on 2.5H. It is assumed that embankment material would be obtained from valley soils. Since firm rock was assumed to be about 50 feet below existing ground surface, only the concrete morning glory spillway would be founded on rock. The rectangular stilling basin, which would have a 5-foot thick apron, would be founded on 18-inch, cast-in-place, concrete piles placed 8 feet apart. The outlet works would consist of one conduit which would be controlled by two slide gates. One gate would be in reserve for emergency closure.

28. RELOCATIONS

The reservoir would necessitate the relocation of 7 miles of light duty road. See figure C16.

29. LAND REQUIREMENTS

Estimated land requirements for the reservoir at S.D.F. elevation and conservation pool elevation are 1950 acres and 1400 acres respectively. During the time of the 1965 survey, the reservoir at both S.D.F. elevation and conservation pool elevation would require the acquisition of 6 houses and 2 farm units. The reservoir location is shown on figure C16.

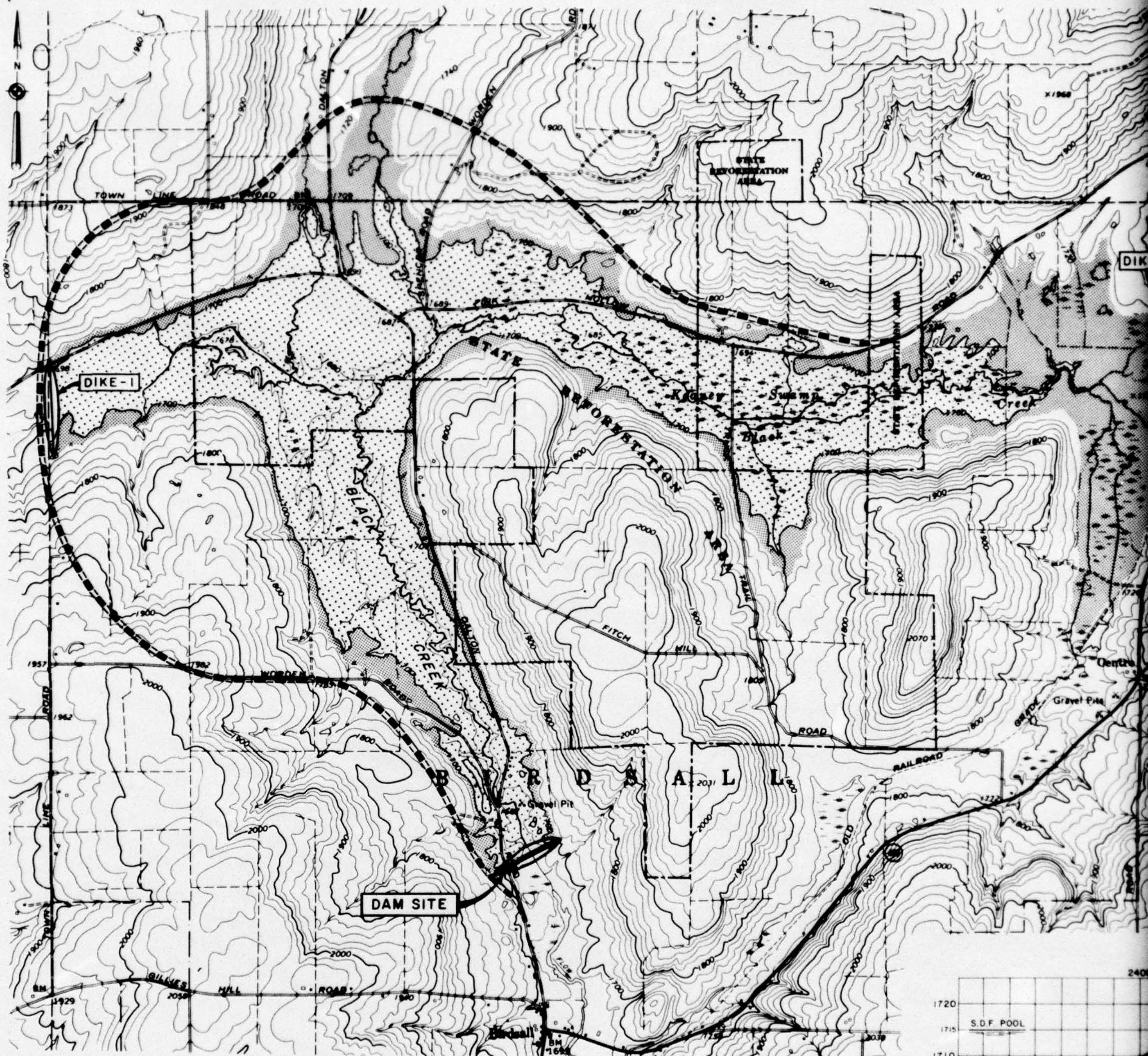
30. CONCLUSIONS

The Summit site was not included in the basin development plans because the benefits were primarily from Fish and Wildlife. Although these benefits are relatively high, it is a Corps policy that only 50 percent of Recreation and Fish and Wildlife benefits may be used to justify the feasibility of a project. Under these conditions the cost-benefit ratio was not favorable.

31. COST ESTIMATE

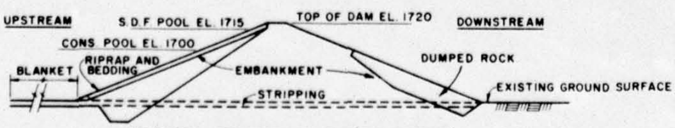
This cost estimate is of a preliminary nature and is to be used for informational purposes only.

REASONABLE CONTRACT ESTIMATE					SHEET OF
PROJECT BLACK CREEK RES. SINGLE PURPOSE (PRELIMINARY)					INVITATION NO.
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	DAM & RESERVOIR				
1	Clearing	1,400	Ac	$ 150.00	$ 210,000
2	Stripping	75,400	CY	0.92	69,368
3	Common Excavation	49,000	CY	0.97	47,530
4	Rock Excavation	400	CY	5.00	2,000
5	Borrow Excavation	480,000	CY	0.58	278,400
6	Earth Embankment	389,200	CY	0.21	81,732
7	Rock Fill	38,700	CY	4.40	170,280
8	Filter Sand & Gravel	11,000	CY	3.00	33,000
9	Upstream Blanket	58,000	CY	0.21	12,180
10	Concrete Mass	3,400	CY	30.00	102,000
11	Concrete Reinforced	6,000	CY	48.00	288,000
12	Portland Cement	10,000	Bbl	5.00	50,000
13	Reinforcing Steel	400,000	#	0.16	64,000
14	Radial Gates & Hoists	---	--	---	---
15	Slide Gates	33	Ton		
16	Spillway Bridge	900	SF	25.00	22,500
17	Control House	---	--	---	---
18	Electrical Work	---	--	---	---
19	Cofferdam & Care of Water				50,000
20	Misc. Items				160,000
21	Cast in Place 18"	5,600	LF	10.00	56,000
	TOTAL DAM & RESERVOIR				1,696,990
	Contingencies @ 25% ±				403,010
	TOTAL DAM & RESERVOIR INC. CONT.				$ 2,100,000
	RELOCATIONS				
2	Highway - Light Duty	7	Mi	200,000	1,400,000
	TOTAL RELOCATIONS				1,400,000
	Contingencies				600,000
	TOTAL RELOCATIONS INC. CONT.				$ 2,000,000
	GOV'T COSTS				
	Engineering & Design				450,000
	Supervision & Administration				350,000
	TOTAL GOV'T COST				800,000
	GRAND TOTAL				$ 4,900,000



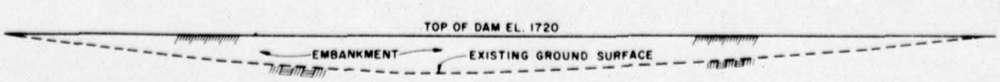
PLAN

SCALE OF FEET



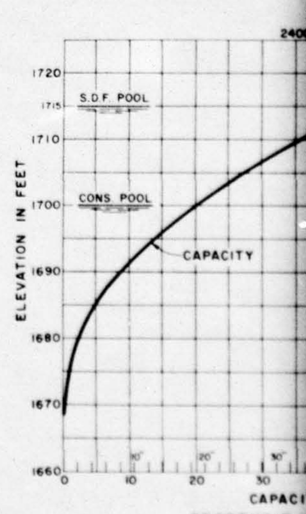
TYPICAL SECTION OF EMBANKMENT

SCALE OF FEET

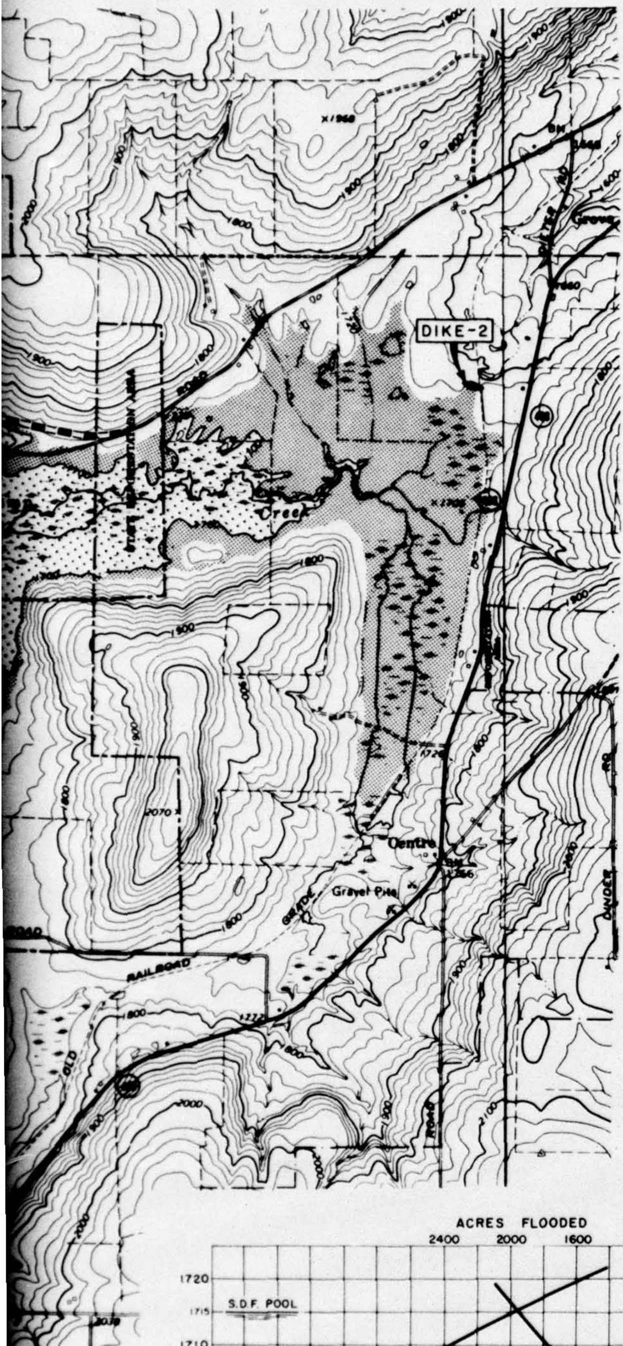


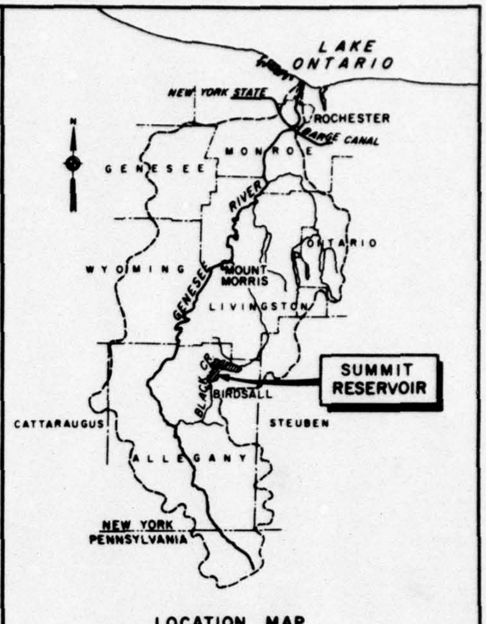
UPSTREAM ELEVATION

SCALE OF FEET



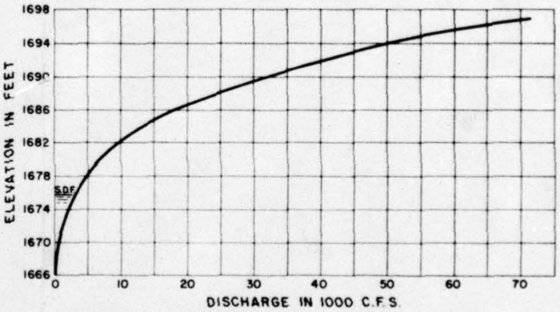
RESERVOIR A



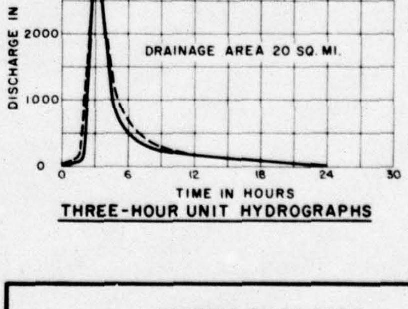


LOCATION MAP

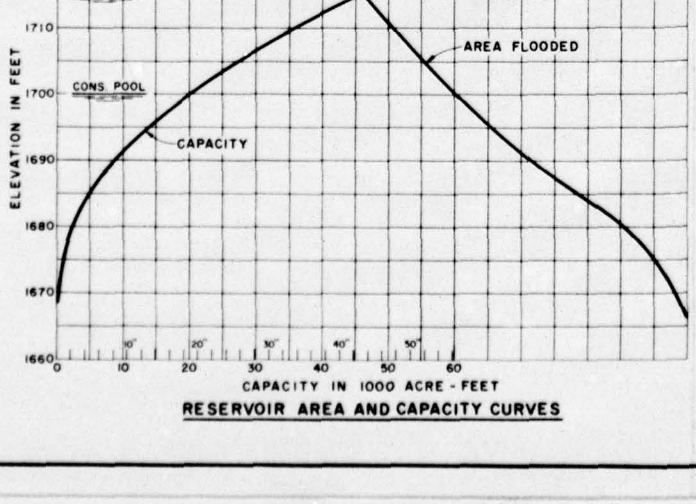
SCALE IN MILES



TAILWATER STAGE - DISCHARGE CURVE



THREE-HOUR UNIT HYDROGRAPHS



RESERVOIR AREA AND CAPACITY CURVES

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

SUMMIT DAM AND RESERVOIR

2

U. S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE C16

COLD CREEK RESERVOIR

32. LOCATION

The Cold Creek dam site is located on Cold Creek in Allegany County, New York, approximately 0.15 of a mile upstream from Hume Road bridge at Hume, New York.

33. PERTINENT DATA

RESERVOIR		
1.	Maximum W.S. elev. (Spillway design flood pool)	1395
2.	Maximum topography, ft.	1420
3.	Flood control pool, elev.	1390
4.	Pool area at maximum W.S., Ac.	550
5.	Pool area at flood control pool, Ac.	510
6.	Channel elevation at toe of dam	1255
7.	Total capacity at flood control pool Ac., ft.	23,800
8.	Total capacity at flood control pool, in.	11
DAM		
9.	Top of dam, elev.	1400
10.	Top width, ft.	20
11.	Height above streambed, ft.	140
12.	Length, ft.	2300
SPILLWAY		
13.	No. of gates	2
14.	Size of gates, ft.	55 x 25
15.	Top of gates, elev.	1390
16.	Crest, elev.	1365
17.	Length (effective), ft	110
18.	Maximum head on crest (design), ft.	30
19.	Design discharge, cfs	59,800
OUTLET WORKS		
20.	No. of conduits	2
21.	Size of each conduit, $ft.^2$	12.8
STILLING BASIN		
22.	Length, ft.	205
23.	Bottom width, ft. (based on assumed pier width)	120
24.	Elev. of bottom	1251
25.	Elev. of end sill	1258

34. HYDRAULIC DESIGN

The maximum probable storm was used as a spillway design storm. This storm was developed from the all-season envelope in the U.S. Weather Bureau Report No. 33. The rainfall distribution was arranged in accordance with EM 1110-2-1405 Corps of Engineers. For a drainage area of 40 square miles, the peak discharge from a maximum probable flood would be 93,800 cfs. After being routed through the reservoir, the M.P.F. produced a spillway design discharge of 59,800 cfs. The gated concrete spillway would be an ogee-shaped weir with a vertical upstream face. The stilling basin would be rectangular in cross section. The outlet works would be designed for a discharge of 810 cfs under full pool conditions (elev. 1390). This flow allows a reasonable reservoir draining time but does not exceed bank-full conditions downstream.

35. SUBSURFACE INVESTIGATION AND FOUNDATION CONDITIONS

The left abutment rising sharply from New York State Route 19 is a steep heavily wooded slope to about elevation 1400, while the right abutment ascends in a series of gently sloping, moderately brush-covered terraces. The overburden is glacial drift with cobbles and boulders which are quite numerous in the creek bed. The soil mantle is about 15 feet thick in the creek bed and varies in thickness at higher elevations. Random fill and bedding material is available from the many gravel pits in close proximity to the site and ample impervious fill is available in the general area. Estimated depths to top of bedrock: left abutment, 35 ft., valley, 15 ft., right abutment, 35 ft.

36. DESIGN DETAILS

The proposed rolled earth embankment would have a crest length of approximately 2300 feet and would rise about 140 feet above the valley floor. The crown width at top elevation of 1400 would be 20 feet. Both the upstream and downstream slopes of the earth embankment would be IV on 2.5H. Embankment material would be obtained from valley soils. The concrete spillway would be founded on rock at the left abutment. The spillway would be regulated by two radial gates which would be 25 feet high by 55 feet long and would be supported by one center pier, 10 feet wide. The stilling basin would be founded on rock. The outlet works would consist of two conduits each controlled by two slide gates. One gate would be in reserve for emergency closure.

37. RELOCATIONS

The reservoir would necessitate the relocation of 1.5 miles of medium duty and 2.0 miles of light duty highways. See figure C17.

38. LAND REQUIREMENTS.

Estimated land requirements for the reservoir are approximately 550 acres. At the time of the 1965 survey, the reservoir would require the acquisition of 12 houses and 4 farm units.

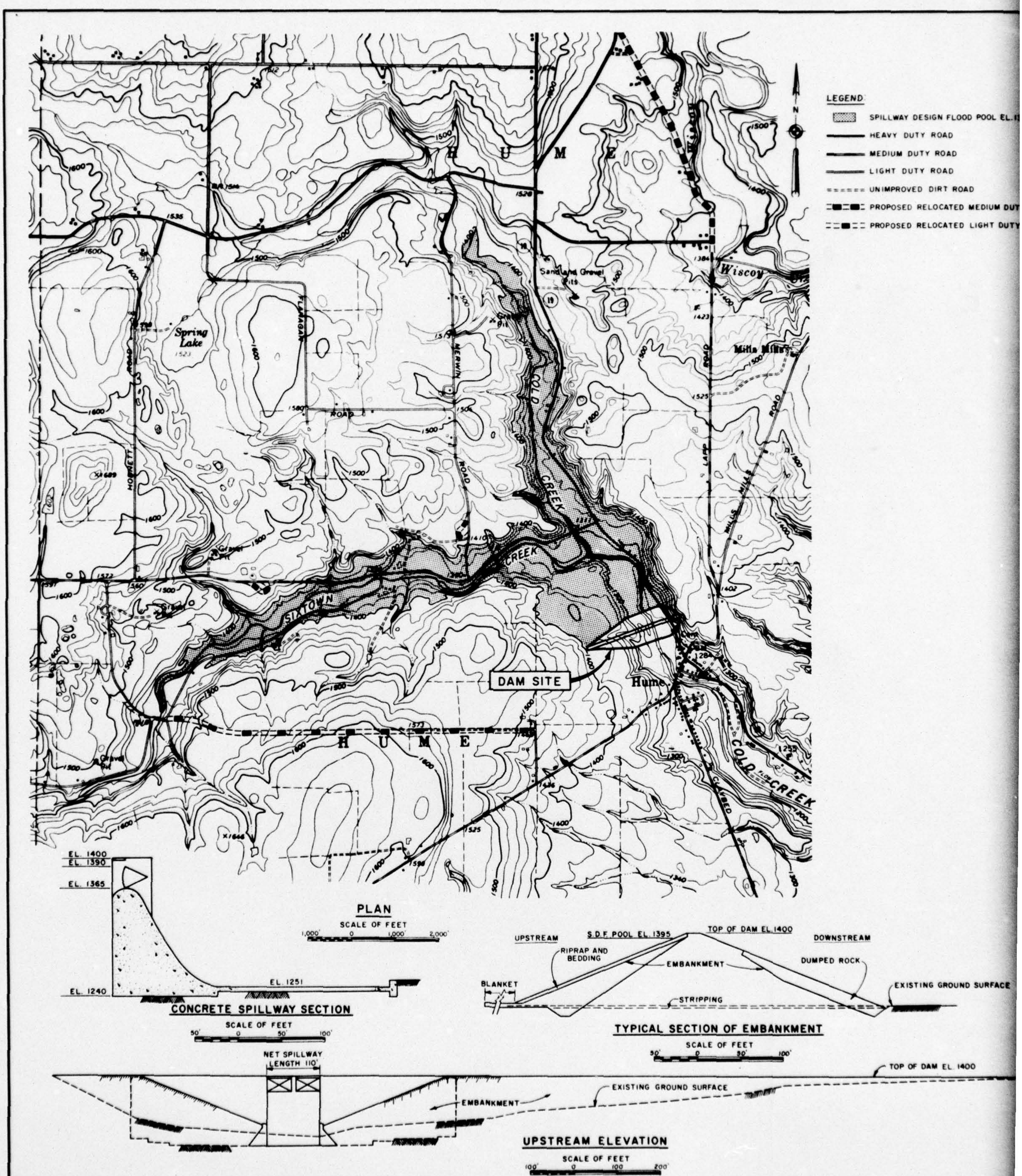
39. CONCLUSIONS

The Cold Creek site was not included in the basin plans because of its unfavorable benefit-cost ratio. A high cost of storage was due to a relatively high structure with a large concrete mass as compared to a relatively small volume of storage. Benefits were small except for Fish and Wildlife.

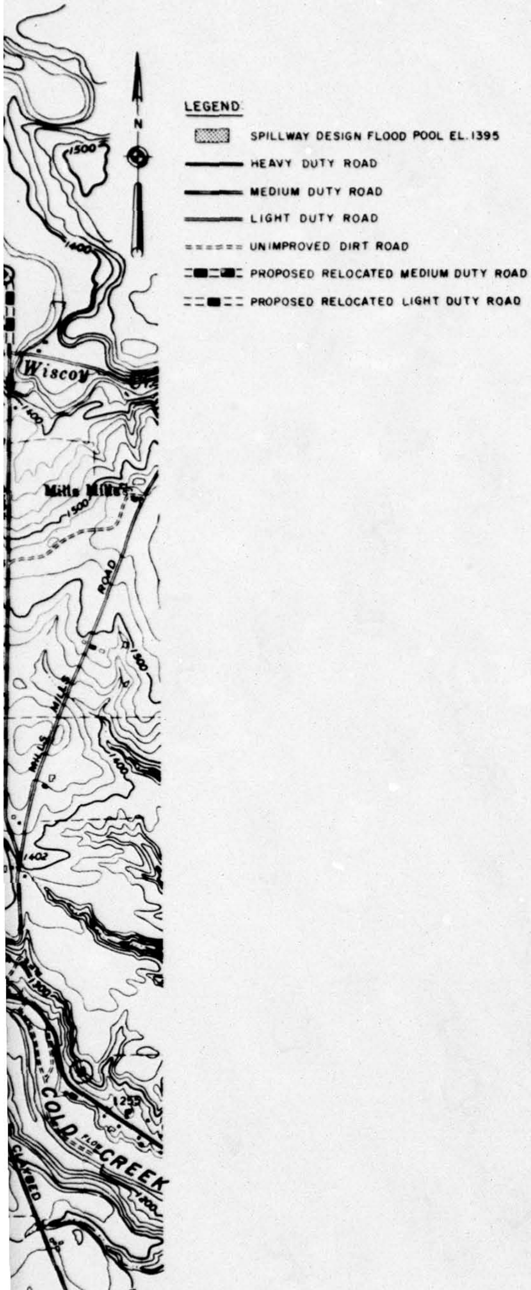
40. COST ESTIMATES

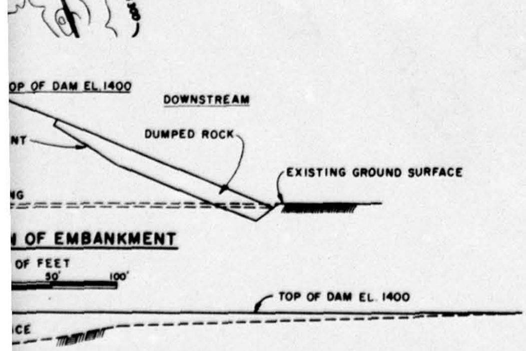
This cost estimate is of a preliminary nature and is to be used for informational purposes only.

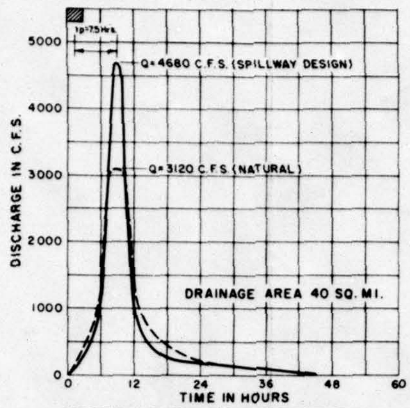
REASONABLE CONTRACT ESTIMATE					SHEET OF
PROJECT COLD CREEK RES. 11" STORAGE W/GATES (PRELIMINARY)					INVITATION NO.
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	DAM & RESERVOIR				
1	Clearing	100	Ac	$ 200.00	$ 20,000
2	Stripping	108,000	CY	0.87	93,960
3	Common Excavation	203,700	CY	0.79	160,923
4	Rock Excavation	33,200	CY	3.90	129,480
5	Borrow Excavation	850,000	CY	0.54	459,000
6	Earth Embankment	786,000	CY	0.20	157,200
7	Rock Fill	69,000	CY	4.20	289,800
8	Filter Sand & Gravel	14,000	CY	3.00	42,000
9	Upstream Blanket	110,000	CY	0.20	22,000
10	Concrete Mass	230,100	CY	19.00	4,371,900
11	Concrete Reinforced	14,700	CY	39.50	580,650
12	Portland Cement	250,000	Bbl	5.00	1,250,000
13	Reinforcing Steel	900,000	#	0.16	144,000
14	Radial Gates & Hoists	214	Ton	2200.00	470,800
15	Slide Gates	29	Ton	1500.00	43,500
16	Spillway Bridge	2,400	SF	25.00	60,000
17	Control House		LS		10,000
18	Electrical Work		LS		20,000
19	Cofferdam & Care of Water		LS		50,000
20	Misc. Items		LS		840,000
	TOTAL DAM & RESERVOIR				9,197,213
	Contingencies @ 25% ±				2,302,787
	TOTAL DAM & RESERVOIR INC. CONT.				$ 11,500,000
	RELOCATIONS				
1	Highway Med. Duty	1.5	Mi	300,000	450,000
2	Highway - Light Duty	2.0	Mi	250,000	500,000
	TOTAL RELOCATIONS				950,000
	Contingencies				250,000
	TOTAL RELOCATIONS INC. CONT.				$ 1,100,000
	GOV'T COSTS				
	Engineering & Design				1,000,000
	Supervision & Administration				900,000
	TOTAL GOV'T COSTS				1,900,000
	GRAND TOTAL				$14,500,000



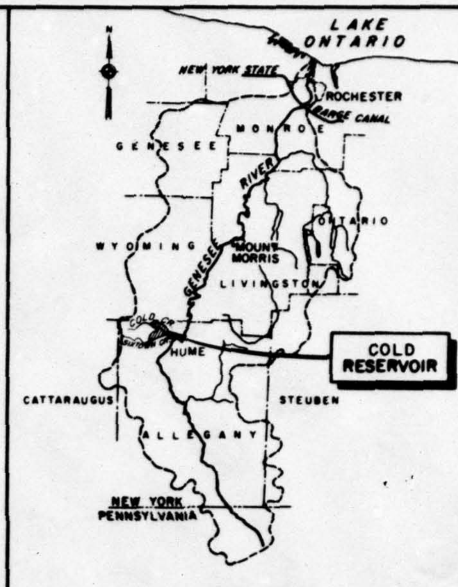
LEGEND
SPILLWAY DESIGN FLOOD POOL EL.1
HEAVY DUTY ROAD
MEDIUM DUTY ROAD
LIGHT DUTY ROAD
UNIMPROVED DIRT ROAD
PROPOSED RELOCATED MEDIUM DUT
PROPOSED RELOCATED LIGHT DUTY
N
HUME
Spring Lake
COLD CREEK
SIXTOWN CREEK
DAM SITE
Hume
Wiscoy
Sand and Gravel Pits
FLANAGAN
MERWIN ROAD
HORNETT ROAD
HUME
PLAN
SCALE OF FEET
1,000'
0
1,000'
2,000'
EL. 1400
EL. 1390
EL. 1365
EL. 1251
EL. 1240
CONCRETE SPILLWAY SECTION
SCALE OF FEET
50'
0
50'
100'
UPSTREAM
S.D.F. POOL EL. 1395
TOP OF DAM EL. 1400
DOWNSTREAM
RIPRAP AND BEDDING
EMBANKMENT
DUMPED ROCK
BLANKET
STRIPPING
EXISTING GROUND SURFACE
TYPICAL SECTION OF EMBANKMENT
SCALE OF FEET
50'
0
50'
100'
NET SPILLWAY LENGTH 110'
TOP OF DAM EL. 1400
EXISTING GROUND SURFACE
EMBANKMENT
UPSTREAM ELEVATION
SCALE OF FEET
100'
0
100
200'





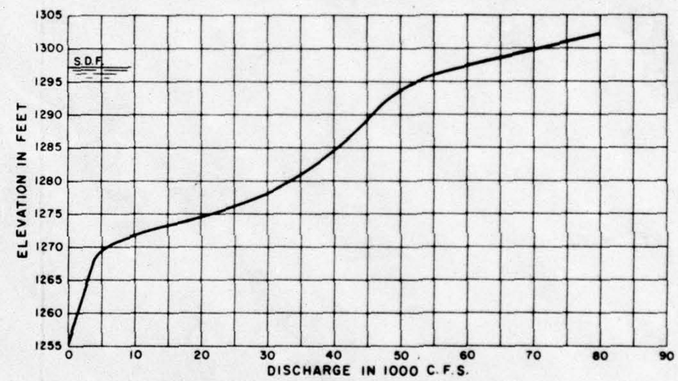


THREE-HOUR UNIT HYDROGRAPHS

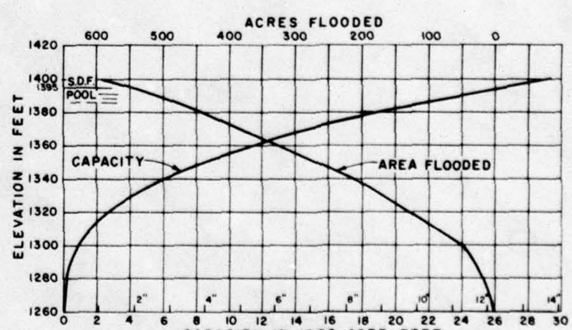


LOCATION MAP

SCALE IN MILES



TAILWATER STAGE-DISCHARGE CURVE



RESERVOIR AREA AND CAPACITY CURVES

GENESEE RIVER BASIN

COMPREHENSIVE STUDY

NEW YORK AND PENNSYLVANIA

COLD CREEK, DAM AND RESERVOIR

U. S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE C17

RUSH CREEK RESERVOIR

41. LOCATION

The Rush Creek dam site is located on Rush Creek in Allegany County, New York, approximately 2.0 miles upstream from its confluence with the Genesee River and about 2.2 miles southeast from Fillmore, New York.

42. PERTINENT DATA

RESERVOIR		
1.	Maximum W.S. elev. (Spillway design flood pool)	1394
2.	Maximum topography, ft.	1420
3.	Conservation pool, ft.	1356
4.	Flood control pool, elev.	1376
5.	Pool area at maximum W.S. Ac.	440
6.	Pool area at conservation pool, Ac.	270
7.	Pool area at flood control pool, Ac.	355
8.	Channel elevation at toe of dam	1240
9.	Total capacity at flood control pool, Ac. ft.	18,600
10.	Total capacity at conservation pool, Ac. ft.	12,500
11.	Total capacity at flood control pool, in.	9
DAM		
12.	Top of dam, elev.	1399
13.	Top width, ft.	20
14.	Height above streambed, ft.	130
15.	Length, ft.	1900
SPILLWAY		
16.	Crest elev.	1376
17.	Length (effective), ft.	235
18.	Maximum head on crest (design), ft.	18
19.	Design discharge, cfs	60,000
OUTLET WORKS		
20.	No. of conduits	2
21.	Size of each conduit, $ft.^2$	10
STILLING BASIN		
22.	Length, ft.	155
23.	Bottom width, ft.	240
24.	Elev. of bottom	1230
25.	Elev. of end sill	1240

43. HYDRAULIC DESIGN

The maximum probable storm was used as a spillway design storm. This storm was developed from the all-season envelope in the U.S. Weather Bureau Report No. 33. The rainfall distribution was arranged in accordance with EM 1110-201405, Corps of Engineers. For a drainage area of 39 square miles, the peak discharge from a maximum probable flood would be 82,550 cfs. After being routed through the reservoir, the M.P.F. produced a spillway design discharge of 60,000 cfs. The uncontrolled concrete spillway would be an ogee-shaped weir with a vertical upstream face. The stilling basin would be rectangular in cross section. The outlet works would be designed for a discharge of 680 cfs at elevation 1328. This flow allows a reasonable reservoir draining time but does not exceed bank-full conditions downstream.

44. SUBSURFACE INVESTIGATIONS AND FOUNDATION CONDITIONS

Although no exposed bedrock was noted at the dam site, outcrops were observed about 0.5 miles downstream of the site near the southwest end of the Erie Railroad bridge. Other outcrops were noted about 1.5 miles upstream of the site. Due to the steepness of the abutment walls, it was assumed that bedrock could be expected at a comparatively shallow depth. Overburden consists of glacial drift with numberous cobbles and boulders, and the streambed was heavily paved with cobbles and boulders. Numerous sand and gravel pits are in the general area from which random fill and bedding can be obtained and ample impervious material is available also. Estimate depths to top of bedrock: left abutment, 35 ft., valley, 20 ft., right abutment, 35 ft.

45. DESIGN DETAILS

The proposed rolled earth embankment would have a crest length of approximately 1900 feet and would rise about 130 feet above the valley floor. The crown width at top elevation of 1399 would be 20 feet. Both the upstream and downstream slopes of the earth embankment would be Iv on 2.5H. It was assumed that embankment material would be obtained from valley soils. The uncontrolled conrete spillway would be founded on rock at the right abutment. The stilling basin would be founded in rock. The outlet works would consist of two conduits each controlled by two slide gates. One gate would be in reserve for emergency closure.

46. RELOCATIONS

The reservoirs would necessitate the relocation of 0.5 miles of light duty highway and one highway bridge with 2400 square feet of deck area. See figure C18.

47. LAND REQUIREMENTS

Estimated land requirements for the reservoir at S.D.F. elevation and conservation pool elevation are 440 acres and 270 acres respectively. During the time of the 1965 survey, the reservoir at both S.D.F. elevation and conservation pool elevation would require the acquisition of 3 houses and 3 farm units.

48. CONCLUSIONS

The Rush Creek site was not included in the basin plans because of its unfavorable benefit - cost ratio. A high cost of storage was due to a relatively high structure with a large concrete mass as compared to a relatively small volume of storage. Benefits were small except for Fish and Wildlife.

49. COST ESTIMATES

This cost estimate is of a preliminary nature and is to be used for informational purposes only.

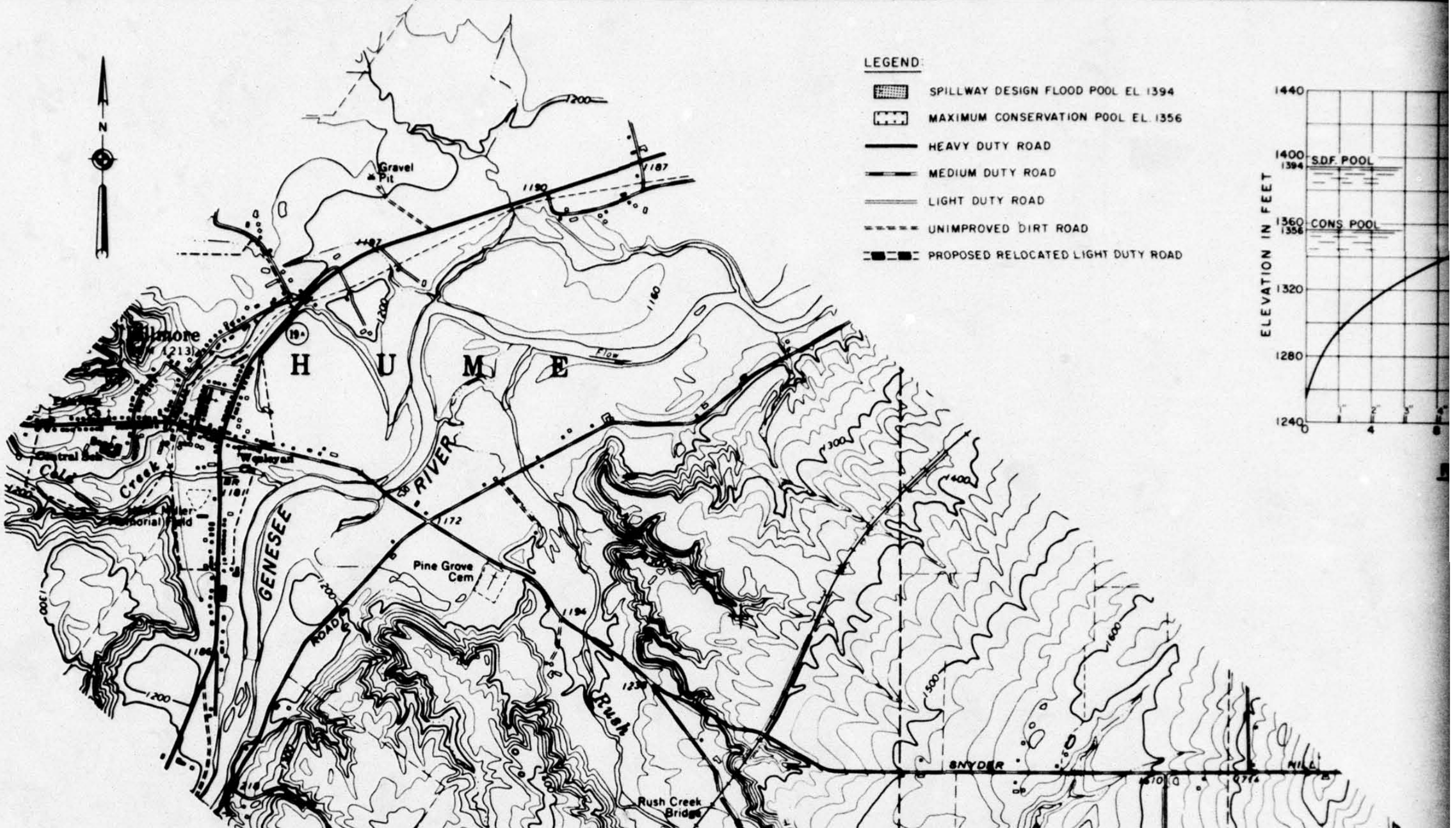
REASONABLE CONTRACT ESTIMATE

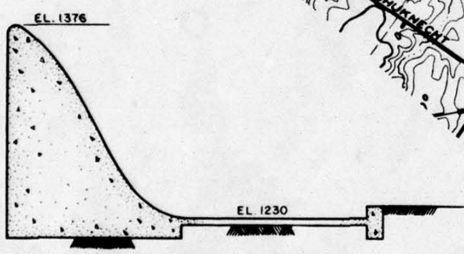
SHEET OF

PROJECT: RUSH CREEK RES. - 9" STORAGE W/O GATES (PRELIMINARY)

INVITATION NO.

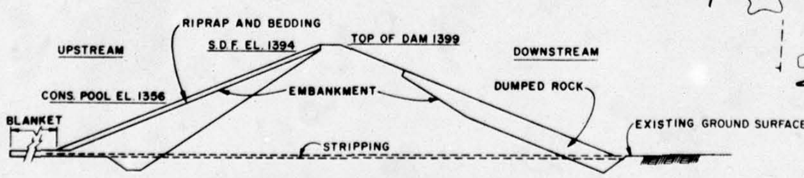
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	DAM & RESERVOIR				
1	Clearing	310	Ac	$ 200.00	$ 62,000
2	Stripping	85,400	CY	0.95	76,860
3	Common Excavation	274,000	CY	0.75	205,500
4	Rock Excavation	42,900	CY	3.75	160,875
5	Borrow Excavation	900,000	CY	0.53	477,000
6	Earth Embankment	898,200	CY	0.20	179,640
7	Rock Fill	61,500	CY	4.20	258,300
8	Filter Sand & Gravel	10,900	CY	3.00	32,700
9	Upstream Blanket	97,100	CY	0.20	19,420
10	Concrete Mass	345,100	CY	18.00	6,211,800
11	Concrete Reinforced	17,700	CY	38.00	672,600
12	Portland Cement	370,000	Bbl	5.00	1,850,000
13	Reinforcing Steel	1,100,000	#	0.16	176,000
14	Radial Gates & Hoists	---	--	---	---
15	Slide Gates	24	Ton	1,500	36,000
16	Spillway Bridge	---	--	---	---
17	Control House	---	--	---	---
18	Electrical Work	---	--	---	---
19	Cofferdam & Care of Water / Misc. Items				1,000,000
	TOTAL DAM & RESERVOIR				11,418,695
	Contingencies @ 25% ±				2,881,365
	TOTAL DAM & RESERVOIR INC. CONT.				$14,300,000
	RELOCATIONS				
1	Highway Bridge				
2	Highway - Light Duty				300,000
	TOTAL RELOCATIONS				
	Contingencies				
	TOTAL RELOCATIONS INC. CONT.				$ 300,000
	GOV'T COSTS				
	Engineering & Design				1,100,000
	Supervision & Administration				1,100,000
	TOTAL GOV'T COST				2,200,000
	GRAND TOTAL				$16,800,000





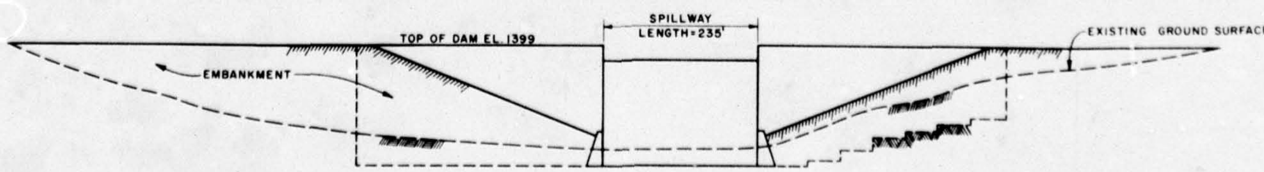
CONCRETE SPILLWAY SECTION

SCALE OF FEET



TYPICAL SECTION OF EMBANKMENT

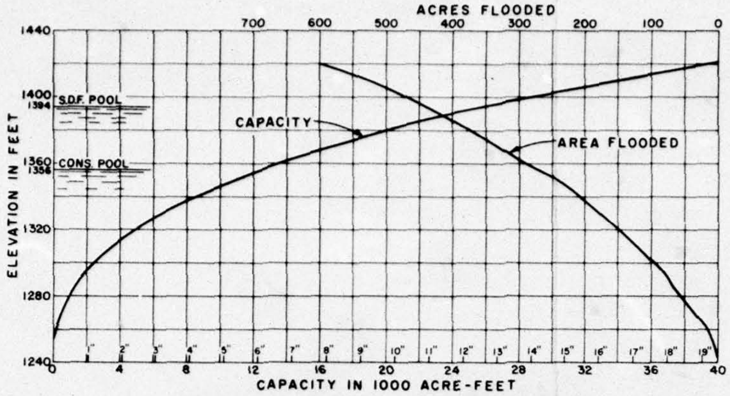
SCALE OF FEET



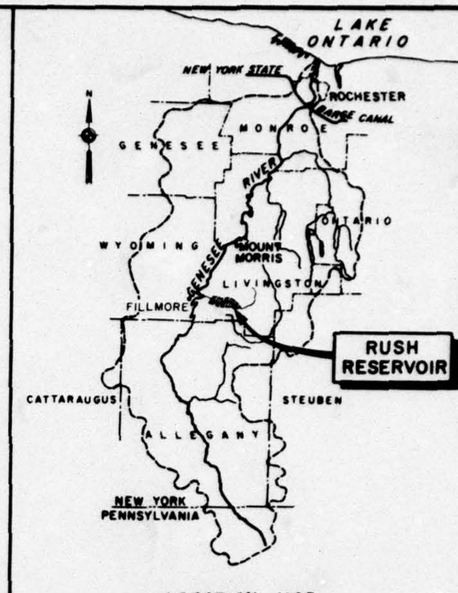
UPSTREAM ELEVATION

SCALE OF FEET

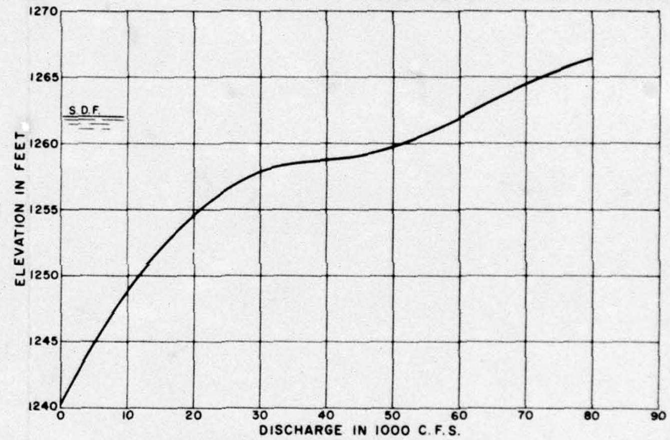
LLWAY DESIGN FLOOD POOL EL. 1394
IMUM CONSERVATION POOL EL. 1356
VY DUTY ROAD
IUM DUTY ROAD
HT DUTY ROAD
MPROVED DIRT ROAD
POSED RELOCATED LIGHT DUTY ROAD



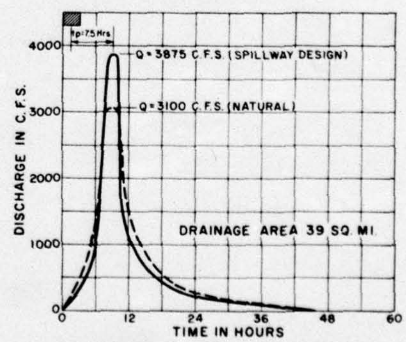
RESERVOIR AREA AND CAPACITY CURVES



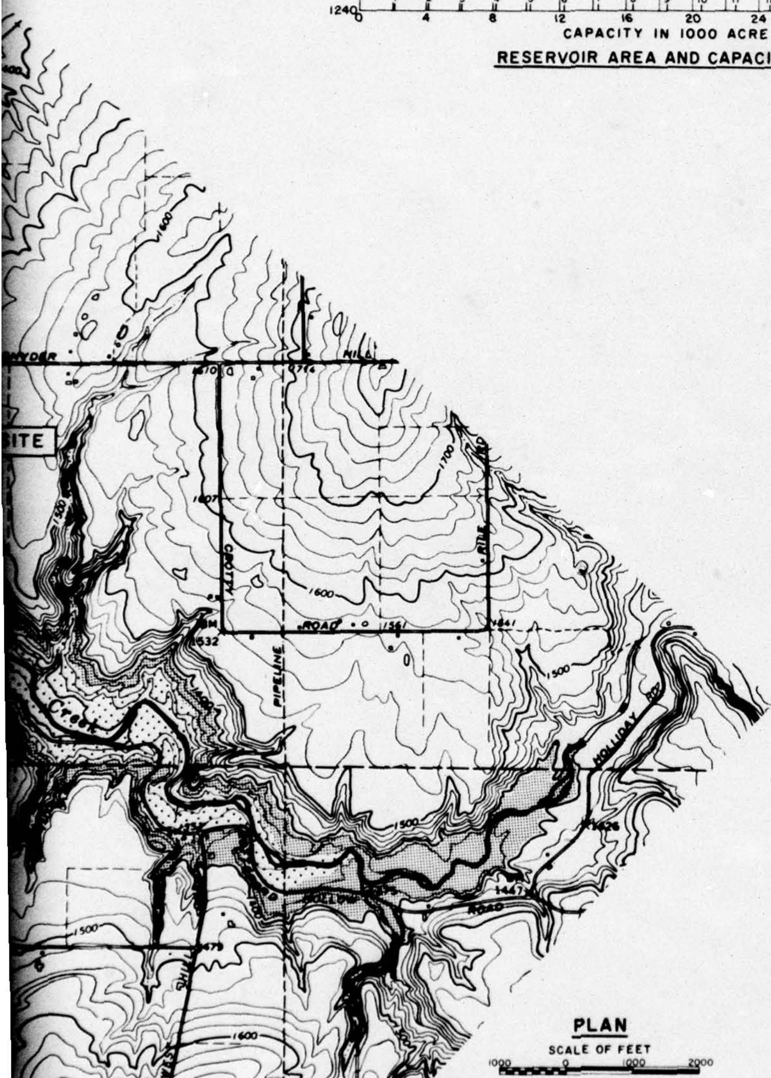
LOCATION MAP
SCALE IN MILES



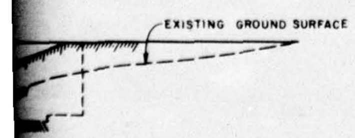
TAILWATER STAGE-DISCHARGE CURVE



THREE-HOUR UNIT HYDROGRAPHS



PLAN
SCALE OF FEET
1000 0 1000 2000



GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

RUSH CREEK, DAM AND RESERVOIR

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

FIGURE C18

WISCOY CREEK RESERVOIR

50. LOCATION

The Wiscoy dam site is located on Wiscoy Creek in Allegany County New York, approximately 0.65 miles upstream from Wiscoy, New York and about 2.2 miles upstream from the confluence of Wiscoy Creek and the Genesee River.

51. PERTINENT DATA

RESERVOIR		
1.	Maximum W.S. elev. (spillway design flood pool)	1416
2.	Maximum topography, ft.	1420
3.	Flood control pool, ft.	1410
4.	Pool area at maximum W.S. Ac.	1075
5.	Pool area at flood control pool, Ac.	900
6.	Channel elevation at toe of dam	1260
7.	Total capacity at flood control pool, Ac. ft.	43,200
8.	Total capacity at flood control pool, in.	7.5
DAM		
9.	Top of dam, elev.	1420
10.	Top width, ft.	20
11.	Height above streambed, ft.	160
12.	Length, ft.	2900
SPILLWAY		
14.	Size of gates, ft.	62 x 28
15.	Top of gates, elev.	1410
16.	Crest elev.	1382
17.	Length (effective), ft.	185
18.	Maximum head on crest (design), ft.	34
19.	Design discharge, cfs	120,000
OUTLET WORKS		
20.	No. of conduits	2
21.	Size of each conduit, $ft.^2$	15
STILLING BASIN		
22.	Length, ft.	235
23.	Bottom width, ft. (based on assumed pier width)	205
24.	Elev. of bottom	1251
25.	Elev. of end sill	1256

52. HYDRAULIC DESIGN

The maximum probable storm was used as a spillway design storm. This storm was developed from the all-season envelope in U.S. Weather Bureau Report No. 33. The rainfall distribution was arranged in accordance with EM 1110-2-1405, Corps of Engineers. For a drainage area of 108 square miles, the peak discharge from a maximum probable flood would be 151,000 cfs. After being routed through the reservoir, the M.P.F. produced a spillway design discharge of 120,000 cfs. The controlled concrete spillway would be an ogee-shaped weir with a vertical upstream face. The stilling basin would be rectangular in cross section. The outlet works would be designed for a discharge of 2100 cfs under full pool conditions (elev. 1410). This flow allows a reasonable reservoir draining time but does not exceed bank-full conditions downstream.

53. SUBSURFACE INVESTIGATIONS AND FOUNDATION CONDITIONS

Bedrock outcrops were noted at this site on both abutments and in the stream bed. The general vicinity provides ample sand and gravel sources for random fill and bedding material. It is believed that impervious material is also available in the general area.

54. DESIGN DETAILS

The proposed rolled earth embankment would have a crest length of approximately 2900 feet and would rise about 160 feet above the valley floor. The crown width at top elevation of 1420 would be 20 feet. Both the upstream and downstream slopes of the earth embankment would be IV on 2.5H. Embankment material would be obtained from valley soils. The concrete spillway would be founded on rock at the center of the valley. The spillway would be controlled by three radial gates which would be 28 feet high and 62 feet long and would be supported by two center piers, 10 feet wide. The stilling basin would be founded on rock. The outlet works would consist of two conduits each controlled by two slide gates. One gate would be in reserve for emergency closure.

55. RELOCATIONS

The reservoir would necessitate the relocation of 1 mile of medium duty highway. See figure C19.

56. LAND REQUIREMENTS

Estimated land requirements for the reservoir at S.D.F elevation are 1075 acres. During the time of the 1965 survey the reservoir would require the acquisition of 6 houses and 7 farm units.

57. CONCLUSIONS

The Wiscoy site was not included in the basin development plans because of its unfavorable benefit - cost ratio. A high cost of storage was due to a relatively high structure with a large concrete mass as compared to a relatively small volume of storage. Benefits were small except for Fish and Wildlife.

58. COST ESTIMATES

This cost estimate is of a preliminary nature and is to be used for informational purposes only.

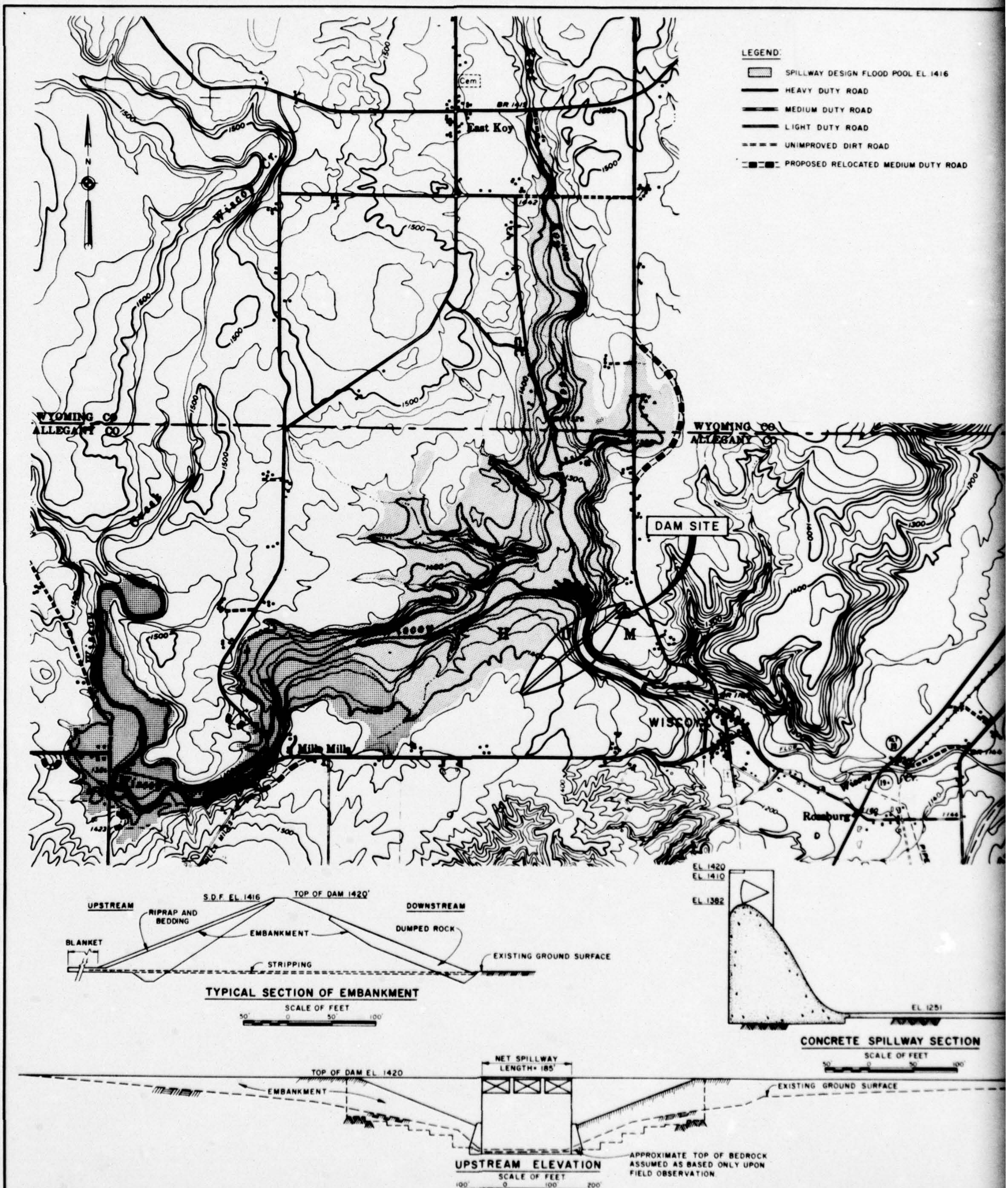
REASONABLE CONTRACT ESTIMATE

SHEET OF

PROJECT: WISCOY CREEK RES. 7.5" STORAGE W/GATES (PRELIMINARY)

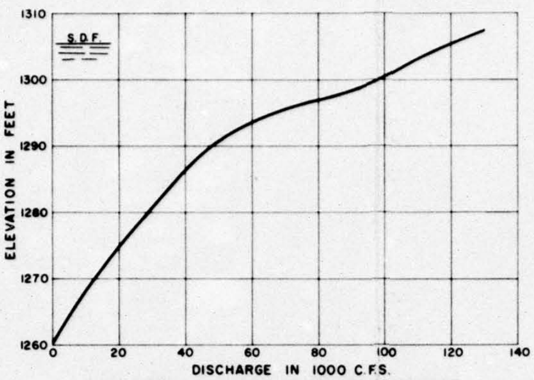
INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	DAM & RESERVOIR				
1	Clearing	400	Ac	$200.00	$ 80,000
2	Stripping	88,500	CY	0.91	80,535
3	Common Excavation	88,800	CY	0.91	80,808
4	Rock Excavation	47,800	CY	3.70	176,860
5	Borrow Excavation	600,000	CY	0.56	336,000
6	Earth Embankment	492,300	CY	0.25	123,075
7	Rock Fill	41,000	CY	4.40	180,400
8	Filter Sand & Gravel	12,700	CY	3.00	38,100
9	Upstream Blanket	94,500	CY	0.25	23,625
10	Concrete Mass	234,000	CY	18.50	4,329,000
11	Concrete Reinforced	25,900	CY	33.50	867,650
12	Portland Cement	260,000	Bbl	5.00	1,300,000
13	Reinforcing Steel	1,600,000	#	0.16	256,000
14	Radial Gates & Hoists	435	Ton	2,000	870,000
15	Slide Gates	36	Ton	1,500	54,000
16	Spillway Bridge	4,100	SF	25.00	102,500
17	Control House		LS		10,000
18	Electrical Work		LS		20,000
19	Cofferdam & Care of Water		LS		50,000
20	Misc. Items				900,000
	TOTAL DAM & RESERVOIR				9,878,553
	Contingencies @ 25% +				2,521,447
	TOTAL DAM & RESERVOIR INC. CONT.				$12,400,000
	RELOCATIONS				
1	Highway Med. Duty	1	Mi	325,000	325,000
	TOTAL RELOCATIONS				325,000
	Contingencies				75,000
	TOTAL RELOCATIONS INC. CONT.				$ 400,000
	GOV'T COSTS				
	Engineering & Design				1,000,000
	Supervision & Administration				1,000,000
	TOTAL GOV'T COSTS				2,000,000
	GRAND TOTAL				$14,800,000

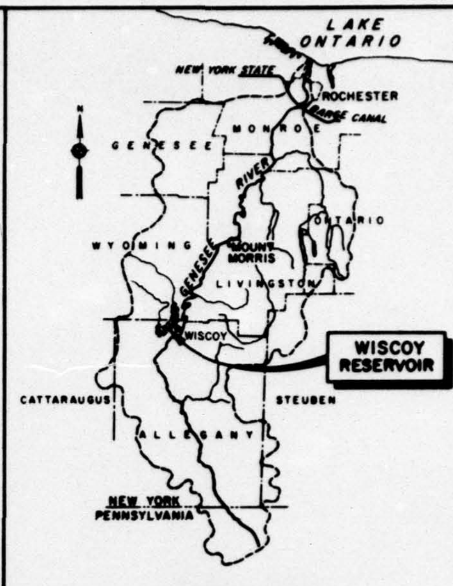

LEGEND:
SPILLWAY DESIGN FLOOD POOL EL. 1416
HEAVY DUTY ROAD
MEDIUM DUTY ROAD
LIGHT DUTY ROAD
UNIMPROVED DIRT ROAD
PROPOSED RELOCATED MEDIUM DUTY ROAD
East Koy
WYOMING CO
ALLEGANY CO
DAM SITE
Wiscoy
Rossburg
UPSTREAM
DOWNSTREAM
S.D.F. EL. 1416
TOP OF DAM 1420'
RIPRAP AND BEDDING
EMBANKMENT
DUMPED ROCK
BLANKET
STRIPPING
EXISTING GROUND SURFACE
TYPICAL SECTION OF EMBANKMENT
SCALE OF FEET
EL 1420
EL 1410
EL 1382
EL 1251
CONCRETE SPILLWAY SECTION
SCALE OF FEET
NET SPILLWAY LENGTH= 185'
TOP OF DAM EL. 1420
EMBANKMENT
EXISTING GROUND SURFACE
APPROXIMATE TOP OF BEDROCK ASSUMED AS BASED ONLY UPON FIELD OBSERVATION.
UPSTREAM ELEVATION
SCALE OF FEET

LEGEND:

- SPILLWAY DESIGN FLOOD POOL EL. 1416
- HEAVY DUTY ROAD
- MEDIUM DUTY ROAD
- LIGHT DUTY ROAD
- UNIMPROVED DIRT ROAD
- PROPOSED RELOCATED MEDIUM DUTY ROAD

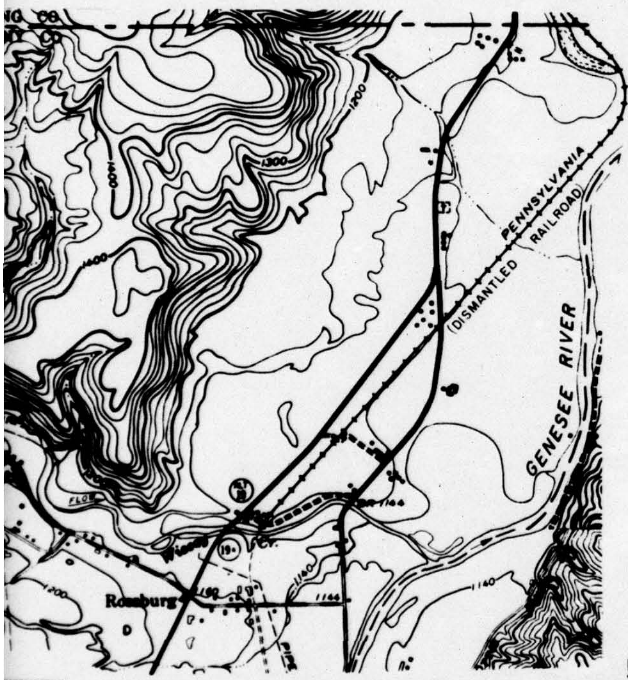


TAILWATER STAGE - DISCHARGE CURVE



LOCATION MAP

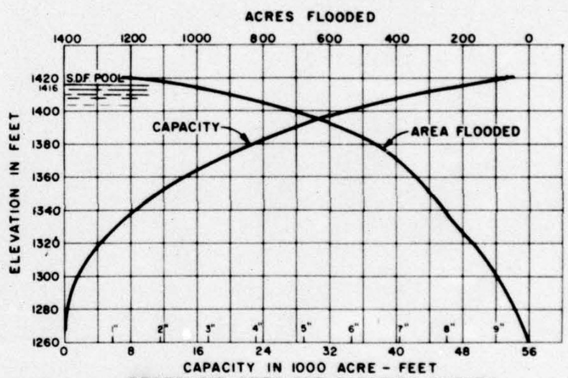
SCALE IN MILES



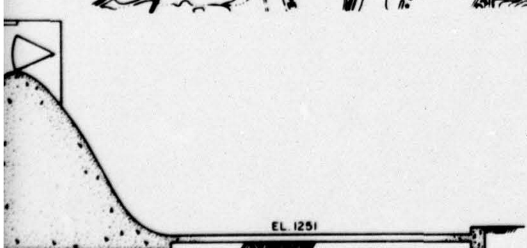
PLAN

SCALE OF FEET

1000' 0 1000' 2000'



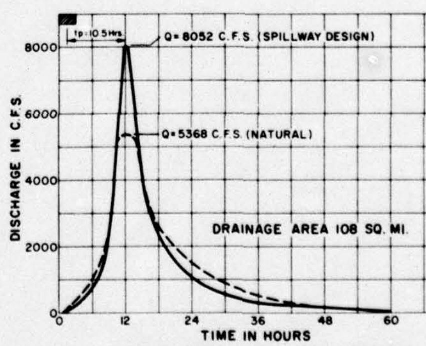
RESERVOIR AREA AND CAPACITY CURVES



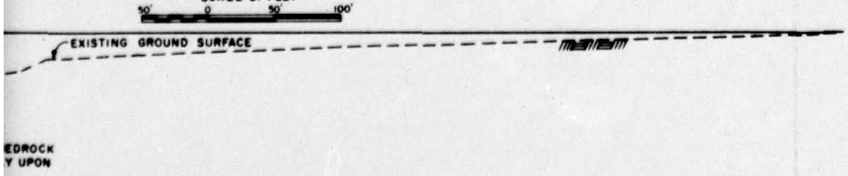
CONCRETE SPILLWAY SECTION

SCALE OF FEET

50' 0 50' 100'



THREE-HOUR UNIT HYDROGRAPHS



GENESEE RIVER BASIN

COMPREHENSIVE STUDY

NEW YORK AND PENNSYLVANIA

WISCOY CREEK, DAM AND RESERVOIR

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

TUSCARORA RESERVOIR

59. LOCATION

The Tuscarora dam site is located on Keshequa Creek in Livingston County, New York, about 2.4 miles upstream from Sonyea, New York.

60. PERTINENT DATA

RESERVOIR	
1. Maximum W.S. elev. (Spillway design flood pool)	815
2. Maximum topography, ft.	820
3. Conservation pool, ft.	784
4. Flood control pool, ft.	810
5. Pool area at maximum W.S. Ac.	1160
6. Pool area at conservation pool, Ac.	660
7. Pool area at flood control pool, Ac.	1055
8. Channel elevation at toe of dam	670
9. Total capacity at flood control pool, Ac.,ft.	46,000
10. Total capacity at conservation pool, Ac., ft.	24,000
11. Total capacity at flood control pool, in.	13
DAM	
12. Top of dam elev.	820
13. Top width, ft.	20
14. Height above streambed, ft.	145
15. Length, ft.	1300
SPILLWAY	
16. No. of gates	3
17. Size of gates, ft.	44 x 26
18. Top of gates, elev.	810
19. Crest elev.	784
20. Length (effective), ft.	130
21. Maximum head on crest (design), ft.	31
22. Design discharge, cfs	72,000
OUTLET WORKS	
23. No. of conduits	2
24. Size of each conduit, $ft.^2$	30
STILLING BASIN	
25. Length, ft.	150
26. Bottom width, ft. (based on assumed pier width)	150
27. Elev. of bottom	658
28. Elev. of end sill	670

61. HYDRAULIC DESIGN

The maximum probable storm was used as a spillway design storm. This storm was developed from the all-season envelope in the U.S. Weather Bureau Report No. 33. The rainfall distribution was arranged in accordance with EM 1110-2-1405, Corps of Engineers. For the drainage area of 69 square miles, the peak discharge from a maximum probable flood would be 125,700 cfs. After being routed through the reservoir, the M.P.F. produced a spillway design discharge of 72,000 cfs. The gated concrete spillway would be an ogee-shaped weir with a vertical upstream face. The stilling basin would be rectangular in cross section. The outlet works would be designed for a discharge of 2500 cfs under conservation pool condition (elev. 784). This flow, which is the approximate mean annual peak, allows a reasonable reservoir draining time but does not exceed bank-full conditions downstream.

62. SUBSURFACE INVESTIGATIONS AND FOUNDATION CONDITIONS

Overburden at the site consists of a relatively shallow mantle of glacial drift with cobbles and boulders. Bedrock, on one side of the gorge, rises almost to the top of the bluff. It was not possible to view the opposite side of the gorge due to heavy brush and timber and access appeared to be very difficult, if not impossible. Bedrock is exposed in the creekbed. It is believed that random fill can be obtained in the general area and impervious material is available in Canaseraga Creek valley.

63. DESIGN DETAILS

Although the dam is primarily a concrete structure, there will be a low rolled earth embankement at its left abutment. The length of the structure, at the top elevation of 820, is about 1300 feet. At the top elevation the dam would rise about 145 feet above the valley floor and would be 20 feet wide. Both the upstream and downstream slopes of the earth embankment would be IV on 2.5H. It is assumed that embankment material would be obtained from valley soils. The concrete spillway would be founded on rock at the center of the valley. The spillway would be controlled by three radial gates which would be 26 feet high by 44 feet long and would be supported by two center piers, 10 feet wide. The stilling basin would be founded on rock. The outlet works would consist of two conduits each controlled by two slide gates. One gate would be in reserve for emergency closure.

64. RELOCATIONS

The reservoir would necessitate the relocation of 2.5 miles of medium duty highway. See figure C20.

65. LAND REQUIREMENTS

Estimated land requirements for the reservoir at S.D.F. elevation and conservation pool elevation are 1160 acres and 660 acres respectively. During the time of the 1965 survey the reservoir would require the acquisition of 50 parcels of land with buildings. The reservoir location is shown on figure C20.

66. CONCLUSIONS

The Tuscarora site was not included in the basin development plans because the benefits were primarily from Fish and Wildlife. Although these benefits are relatively high, it is a Corps policy that only 50 percent of Recreation and Fish and Wildlife benefits may be used to justify the feasibility of a project. Under these conditions the benefit - cost ratio was not favorable.

67. COST ESTIMATES.

This cost estimate is of a preliminary nature and is to be used for informational purposes only.

REASONABLE CONTRACT ESTIMATE					SHEET 1 OF 3
PROJECT: TUSCARORA DAM-KESHEQUA CREEK RESERVOIR					INVITATION NO.
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	TOTAL ESTIMATED FIRST COST				
	Concrete Dam				$12,220,000
	Relocations				3,680,000
	TOTAL ESTIMATED FIRST COST				$15,900,000
	OPERATION & MAINTENANCE				
	Concrete Dam				30,000
	Relocations				---
	TOTAL ESTIMATED OPERATION & MAINTENANCE				$ 30,000

PRE...

REASONABLE CONTRACT ESTIMATE

SHEET 2 OF 3

PROJECT: TUSCARORA DAM-KESHEQUA CREEK RESERVOIR

INVITATION NO.

ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	CONCRETE DAM				
	MULTI-PURPOSE RESERVOIR				
	Elevations				
	Top 820				
	Spillway Crest 784				
	Top of Gates 810				
1	Clearing	200	Ac	$ 250.00	$ 50,000
2	Cofferdams & Care of Water		LS		275,000
3	Excavation-Common	51,000	CY	1.75	89,250
4	Excavation-Stripping	1,000	CY	1.75	1,750
5	Excavation-Rock	131,500	CY	5.00	657,500
6	Embankment-Compacted	50,500	CY	0.45	22,725
7	Rock Fill	11,000	CY	3.25	35,750
8	Mass Concrete-Spillway Weir, Abutments, Training Walls	243,000	CY	19.75	4,799,250
9	Concrete-Stilling Basin and End Sill	4,400		34.00	149,600
10	Concrete-Gate Piers	2,800		46.50	130,200
11	Portland Cement	253,000	Bbl	5.00	1,265,000
12	Steel Reinforcement	450,000	LB	0.15	67,500
13	Tainter Gate w/Embedded Metal & Machinery	3	Ea	135,000	405,000
14	Tainter Gate Machinery Housing		LS		15,000
15	Slide Gate & Accessories	3	Ea	30,000	90,000
16	Conduit Lining	3	Ea	4,500	13,500
17	Control Structure				40,000
18	Electrical Work				75,000
19	Service Bridge		LS		40,000
20	Steel Guard Railing	1,400	LS	10.75	15,050
21	Miscellaneous Items		LS		300,000
	TOTAL ESTIMATED CONTRACTOR'S EARNINGS				$ 8,537,075
	Contingencies				1,722,925
	TOTAL ESTIMATED CONTRACTOR'S EARNINGS PLUS Contingencies-Concrete Dam				$10,260,000
	Engineering & Design				1,180,000
	Supervision & Administration				780,000
	TOTAL ESTIMATED FIRST COST - CONCRETE DAM				$12,220,000
	OPERATION & MAINTENANCE		1		
	Operation			26,000	
	Maintenance			4,000	
	TOTAL O & M				$ 30,000

PRELIMINARY

REASONABLE CONTRACT ESTIMATE

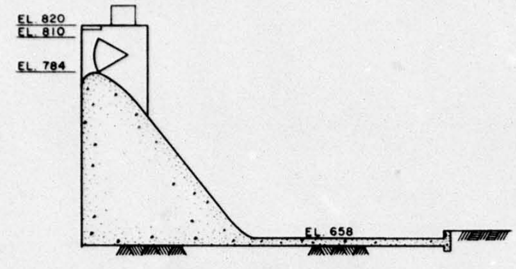
SHEET 3 OF 3

PROJECT: TUSCARORA DAM, KESHEQUA CREEK RESERVOIR

INVITATION NO.

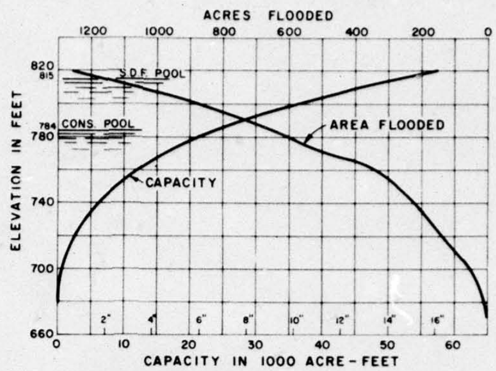
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	RELOCATIONS				
	MULTIPLE PRUPOSE RESERVOIR				
	HIGHWAY:				
	Relocation of 2.1 miles of N.Y.S. Rt. 250 - Union Corners to Tuscarora by reconstructing existing roads from Union Corners to Village Line of Nunda		LS		$ 2,405,000
	Connection Between Livingston County Rt. 30 Livingston County Rt. 43		LS		110,000
	UTILITIES:				
	Relocation of 33 K.V. Transmission line over Keshequa Creek		LS		35,000
	TOTAL ESTIMATED CONTRACTORS EARNINGS				$2,550,000
	Contingencies				520,000
	TOTAL ESTIMATED CONTRACTORS EARNINGS PLUS Contingencies - Relocation				$3,070,000
	Engineering & Design				380,000
	Supervision & Administration				230,000
	TOTAL ESTIMATED FIRST COST - Relocations				$3,680,000

PRELIMINARY

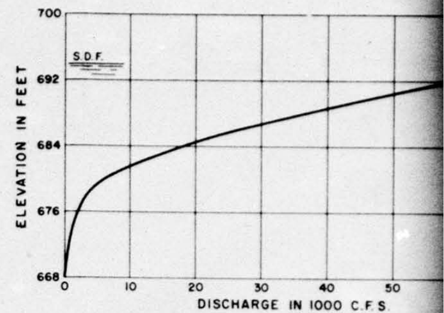


CONCRETE SPILLWAY SECTION

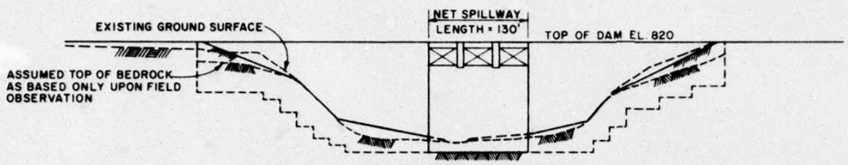
SCALE OF FEET
50' 0 50' 100'



RESERVOIR AREA AND CAPACITY CURVES

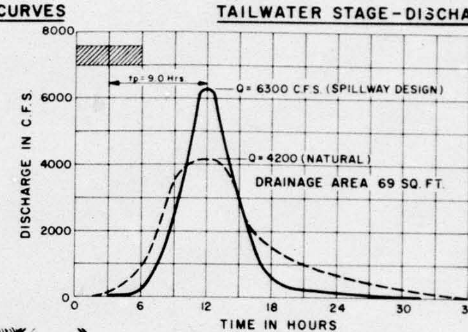


TAILWATER STAGE - DISCHARGE CU

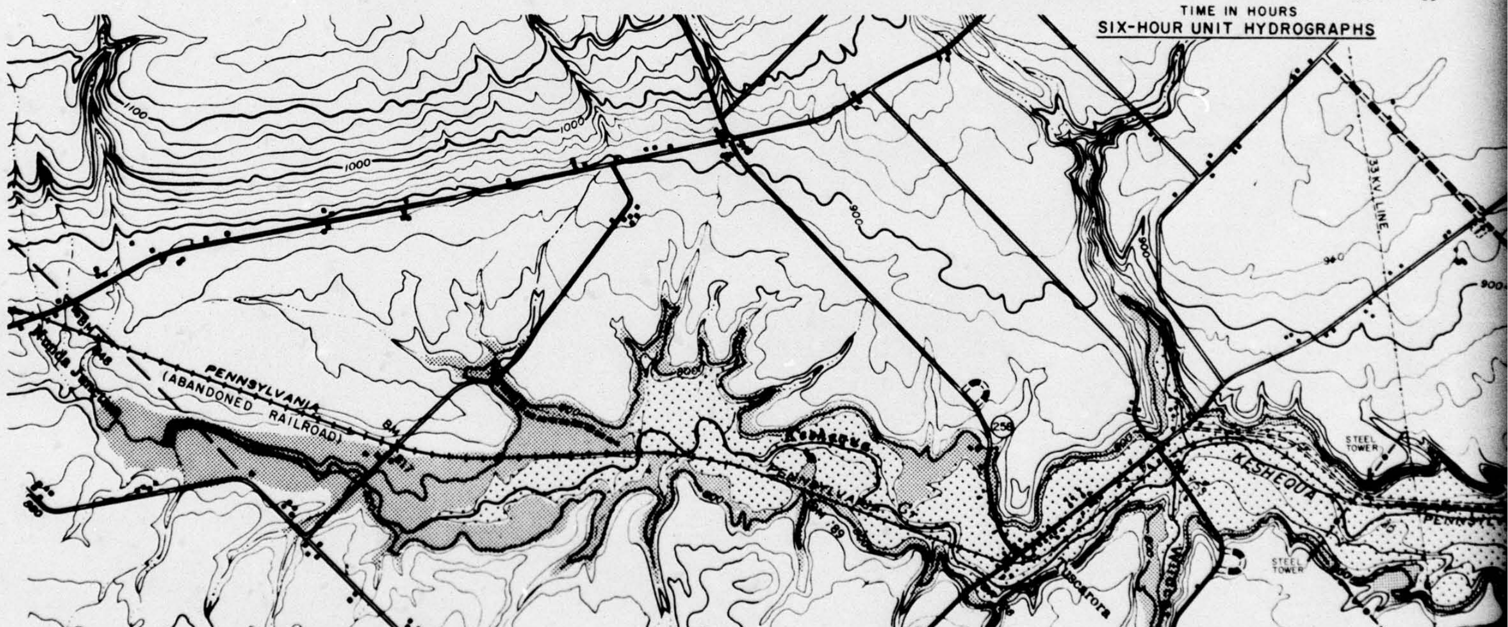


UPSTREAM ELEVATION

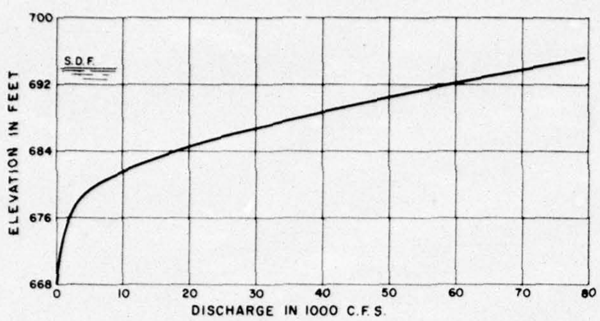
SCALE OF FEET
100' 0 100' 200'



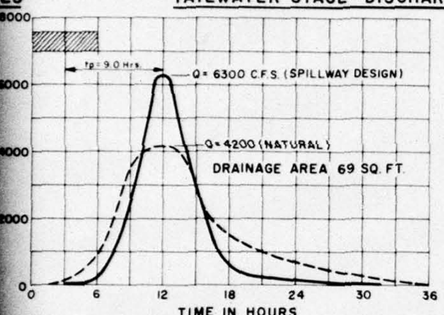
SIX-HOUR UNIT HYDROGRAPHS



2.1 MILES OF RELOCATED ROADS; C.R. #34 TO N.Y. #258: (RECONSTRUCT WHIPPLE RD - 0.5 MILES, RECONSTRUCT TOWN LINE RD. TO UNION CORNERS - 1.6 MILES)



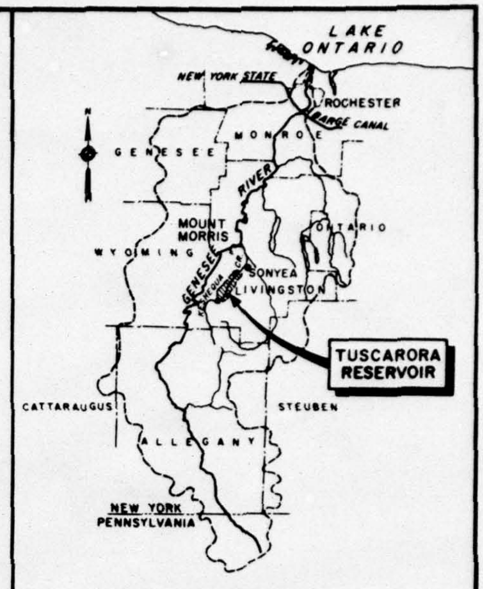
TAILWATER STAGE-DISCHARGE CURVE



SIX-HOUR UNIT HYDROGRAPHS

LEGEND

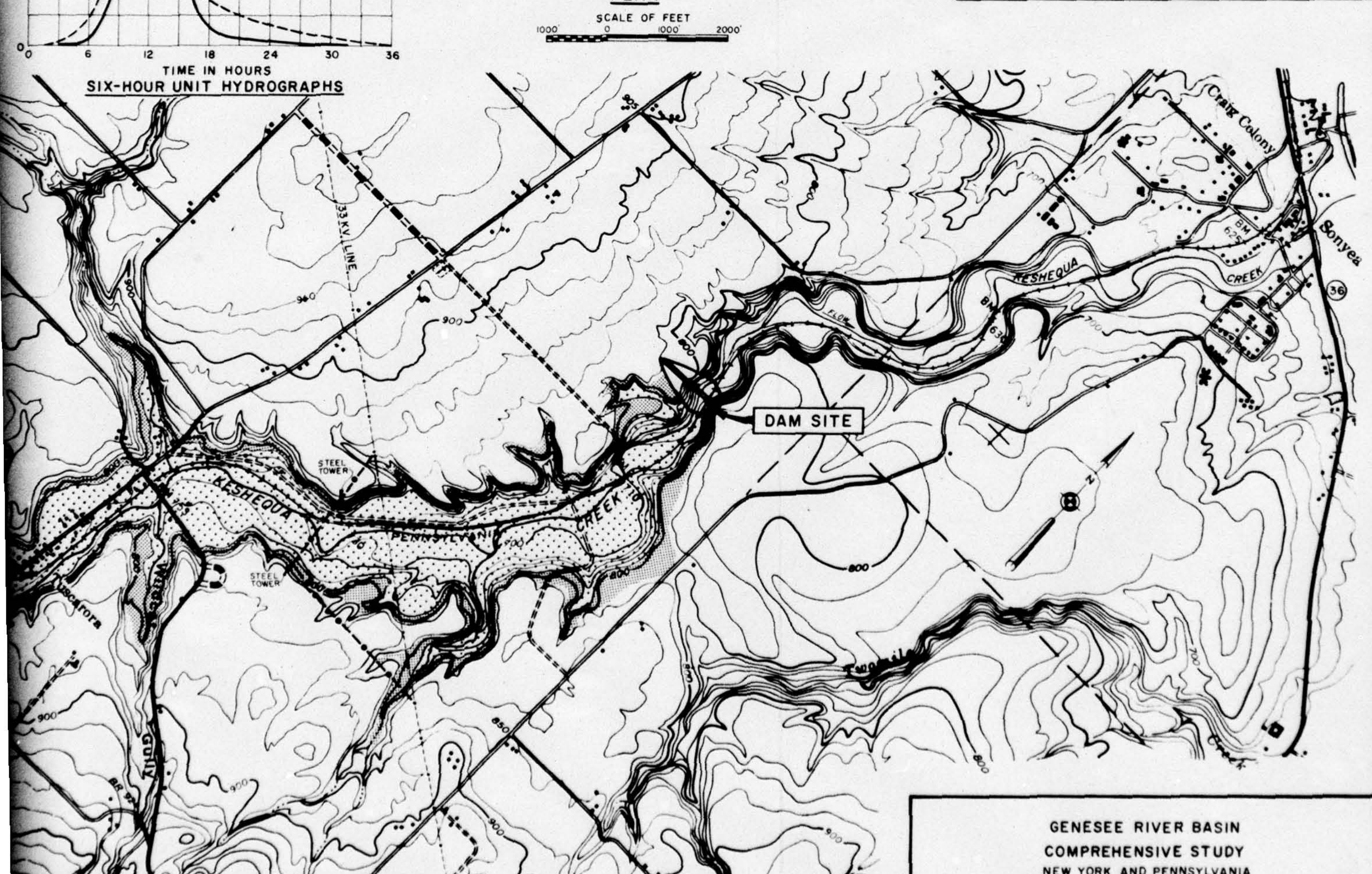
- SPILLWAY DESIGN FLOOD POOL EL. 815
- MAXIMUM CONSERVATION POOL EL. 784
- HEAVY DUTY ROAD
- MEDIUM DUTY ROAD
- LIGHT DUTY ROAD
- UNIMPROVED DIRT ROAD
- PROPOSED RELOCATED MEDIUM DUTY ROAD
- POWER LINE
- PROPOSED RELOCATED POWER LINE



LOCATION MAP

SCALE IN MILES

PLAN



GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

TUSCARORA DAM AND RESERVOIR

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE C20

POAGS HOLE RESERVOIR

68. LOCATION

Poags Hole dam site is located on Canaseraga Creek in Steuben County, New York, approximately 4 miles upstream from Dansville, and about 1 mile west of Stony Brook State Park.

69. PERTINENT DATA

RESERVOIR		
1.	Maximum W.S. elev. (Spillway design flood pool)	994
2.	Maximum topography, ft.	1120
3.	Conservation pool, ft.	932
4.	Flood control pool, ft.	988
5.	Pool area at maximum W.S. Ac.	670
6.	Pool area at conservation pool, Ac	375
7.	Pool area at flood control pool, Ac.	625
8.	Channel elevation at toe of dam	776
9.	Total capacity at flood control pool, Ac. ft.	56,000
10.	Total capacity at conservation pool, Ac. ft.	26,000
11.	Total capacity at flood control pool, in.	11.5
DAM		
12.	Top of dam, elev.	1000
13.	Top width, ft.	20
14.	Height above streambed, ft.	210
15.	Length, ft.	1700
SPILLWAY		
16.	No. of gates	5
17.	Size of gates, ft.	60 x 18
18.	Top of gates, elev.	988
19.	Crest elev.	970
20.	Length (effective), ft.	300
21.	Maximum head on crest (design), ft.	24
22.	Design discharge, cfs	117,000
OUTLET WORKS		
23.	No. of conduits	2
24.	Size of each conduit, $ft.^2$	50
STILLING BASIN		
25.	Length, ft.	120
26.	Bottom width, ft. (based on assumed pier width)	340
27.	Elev. of bottom	779
28.	Elev. of end sill	789

70. HYDRAULIC DESIGN

The maximum probable storm was used as a spillway design storm. This storm was developed from the all-season envelope in U.S. Weather Bureau Report No. 33. The rainfall distribution was arranged in accordance with EM 1110-2-1405, Corps of Engineers. For a drainage area of 89 square miles, the peak discharge from a maximum probable flood would be 131,900 cfs. After being routed through the reservoir the M.P.F. produced a spillway design discharge of 117,000 cfs. The gated concrete spillway would be an ogee-shaped weir with a vertical upstream face. The stilling basin would be rectangular in cross section. The outlet works would be designed for a 7200 cfs discharge under conservation pool conditions (elev. 932). This flow allows a reasonable reservoir draining time but does not exceed bank-full conditions downstream.

71. SUBSURFACE INVESTIGATIONS AND FOUNDATION CONDITIONS

The right bank consists of shale with a shallow soil mantle. The left bank, from visual observation, consists of thickly stratified silty sands, silts and clays. Though some pervious zones occur, they are not as massive as at nearby areas, and since the ground rises in a westerly direction, seepage and possible piping would not pose as serious a problem as at nearby areas. Estimated depths to top of bedrock: left abutment, 30 ft., valley, 10 ft., right abutment, 15 ft.

72. DESIGN DETAILS

The proposed rolled earth embankment would have a crest length of approximately 1700 feet and would rise about 210 feet above the valley floor. The crown width at top elevation of 1000 would be 20 feet. Both the upstream and downstream slopes of the earth embankment would be IV on 2.5H. It was assumed that embankment material could be obtained from valley soils. The concrete spillway would be founded on rock at the center of the valley. The spillway would be controlled by five radial gates which would be 18 feet high by 60 feet long and would be supported by four center piers, 10 feet wide. The stilling basin would be founded on rock and would have a 5-foot thick apron slab. The outlet works would consist of two conduits each controlled by two slide gates. One gate would be in reserve for emergency closure.

73. RELOCATIONS

The reservoir would necessitate the relocation of 1 mile of light duty highway. See figure C21.

74. LAND REQUIREMENTS

Estimated land requirements for the reservoir at S.D.F. elevation and conservation pool elevation are 670 acres and 375 acres respectively. During the time of the 1965 survey, the reservoir would require the acquisition of 11 houses and Sugar Creek Glen Park.

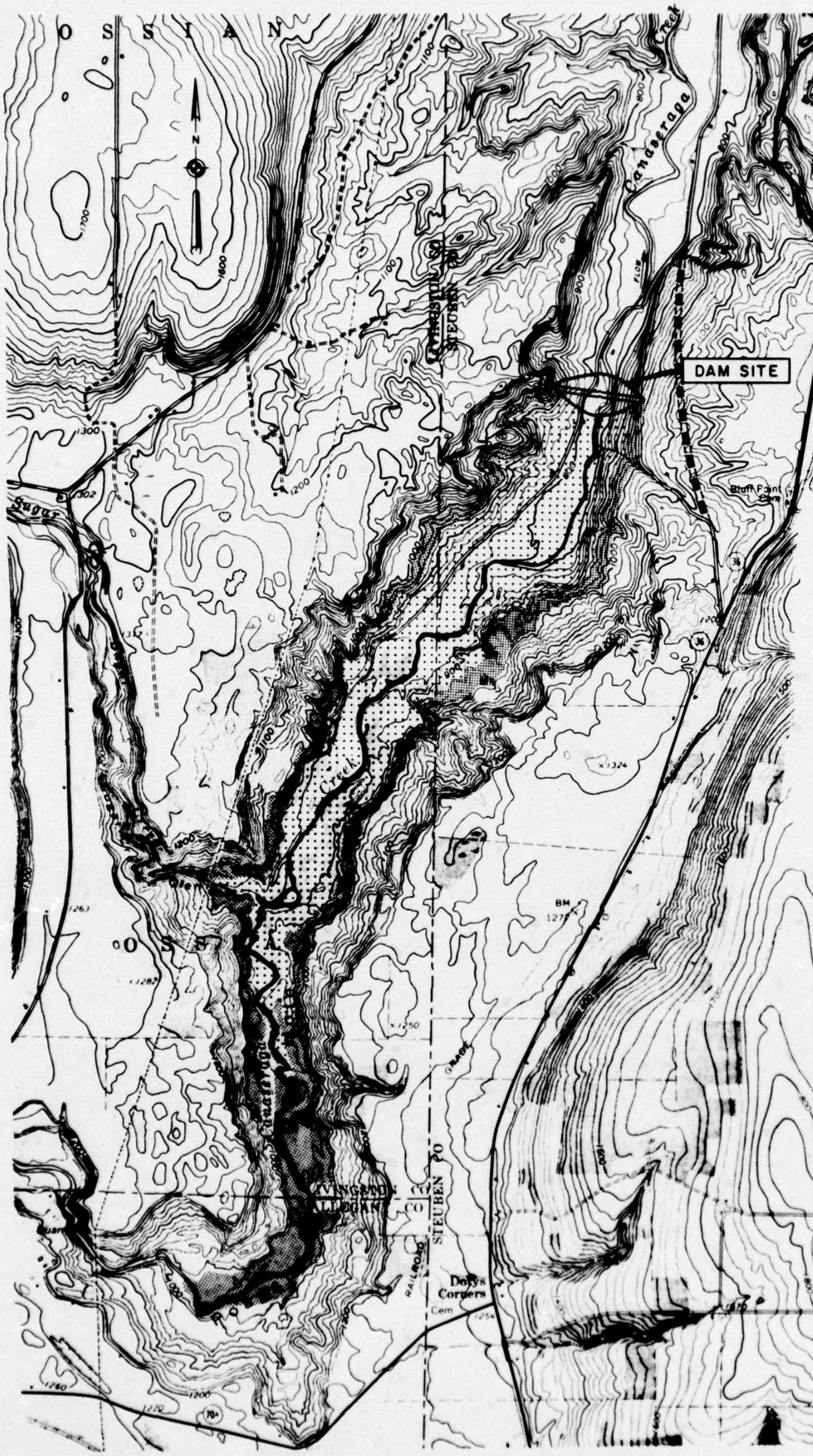
75. CONCLUSIONS

Poags Hole Reservoir site was not included in the basin development plans because of the high cost of storage as compared to the recommended sites. The high cost of storage would be largely due to concrete costs. The relatively small benefits except for Fish and Wildlife made the Poags Hole site an unattractive possibility for basin development.

76. COST ESTIMATES

This cost estimate is of a preliminary nature and is shown for informational purposes only.

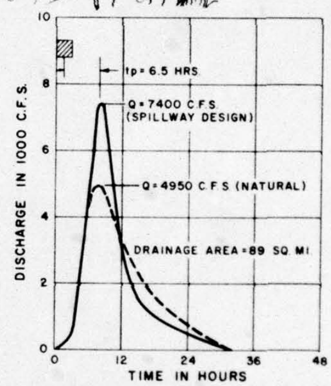
REASONABLE CONTRACT ESTIMATE					SHEET OF
PROJECT POAG'S HOLE-DAM SITE #2 - MULTIPLE-PURPOSE 12" (PRELIMINARY)					INVITATION NO.
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	DAM & RESERVOIR				
1	Clearing	300	Ac	$ 200	$ 60,000
2	Stripping	32,300	CY	1.00	32,300
3	Common Excavation	1,168,000	CY	0.68	794,240
4	Rock Excavation	51,500	CY	3.70	190,550
5	Borrow Excavation	---		---	---
6	Earth Embankment	780,500	CY	0.20	156,100
7	Rock Fill	23,000	CY	6.00	138,000
8	Filter Sand & Gravel	3,900	CY	3.00	11,700
9	Upstream Blanket	128,000	CY	0.20	25,600
10	Concrete Mass	666,000	CY	17.50	11,655,000
11	Concrete Reinforced	23,000	CY	35.00	805,000
12	Portland Cement	700,000	Bbl	5.00	3,500,000
13	Reinforcing Steel	1,400,000	#	0.16	224,000
14	Radial Gates & Hoists	426	Ton	2,000	852,000
15	Slide Gates	135	Ton	1,500	202,500
16	Spillway Bridge	6,800	SF	25.00	170,000
17	Control House				10,000
18	Electrical Work				40,000
19	Cofferdam & Care of Water				100,000
20	Misc. Items				1,900,000
	TOTAL DAM & RESERVOIR				$ 20,866,990
	Contingencies @ 25% ±				5,133,010
	TOTAL DAM & RESERVOIR INC. CONT.				$ 26,000,000
	RELOCATIONS				
1	Highway-light Duty	1	Mi		250,000
	TOTAL RELOCATIONS				250,000
	Contingencies @ 25%				50,000
	TOTAL RELOCATIONS INC. CONT.				300,000
	TOTAL PROJECT COSTS				$ 26,300,000
	GOV'T COSTS				
	Engineering & Design				1,800,000
	Supervision & Administration				1,900,000
	TOTAL GOV'T COSTS				3,700,000
	GRAND TOTAL				$30,000,000



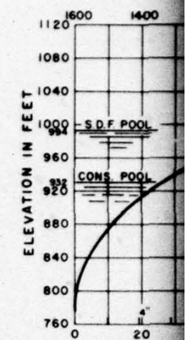
PLAN

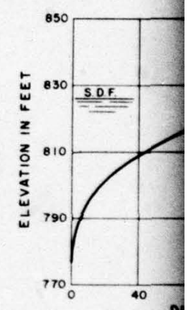
SCALE OF FEET

1000' 0 1000' 2000'

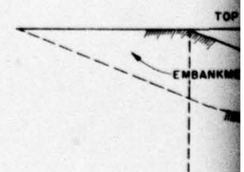


THREE-HOUR UNIT HYDROGRAPHS



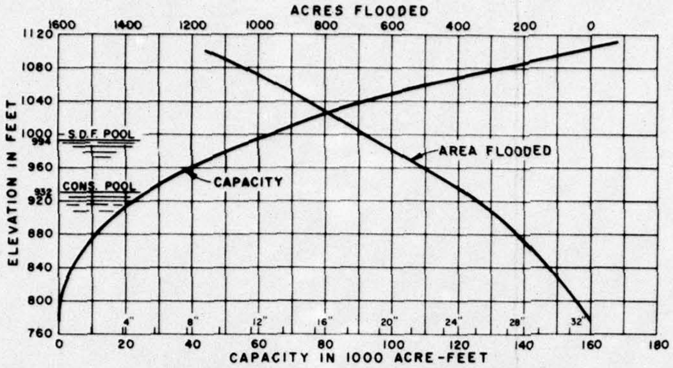


TAILWATE

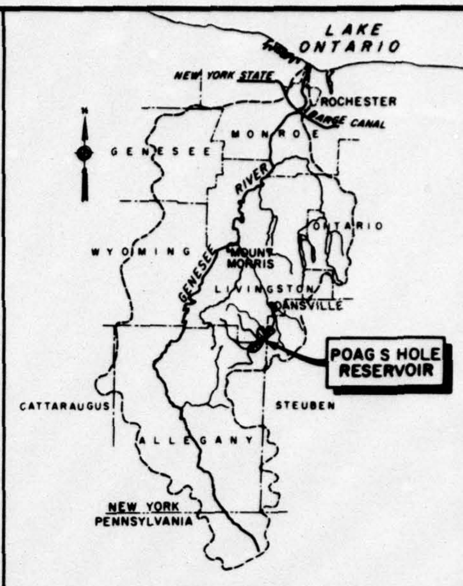


LEGEND

- SPILLWAY DE
- MAXIMUM CO
- HEAVY DUTY
- MEDIUM DUT
- LIGHT DUTY
- UNIMPROVED
- PROPOSED R



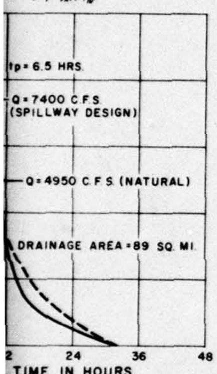
RESERVOIR AREA AND CAPACITY CURVES



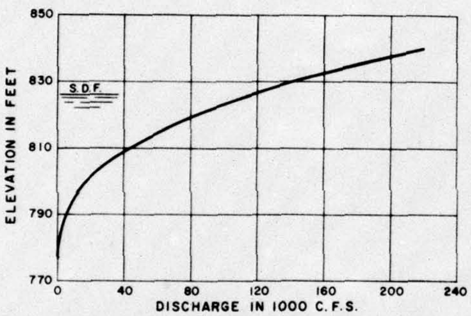
LOCATION MAP

SCALE IN MILES

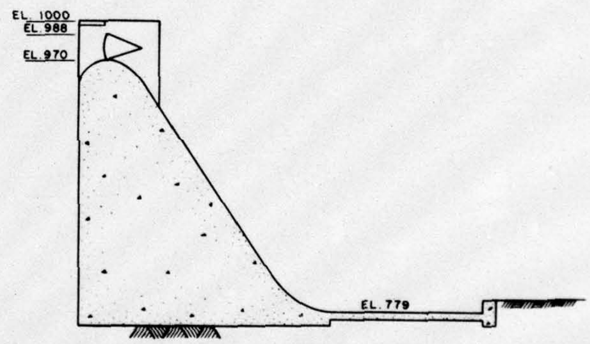
3 0 3 6 9



OUR UNIT HYDROGRAPHS



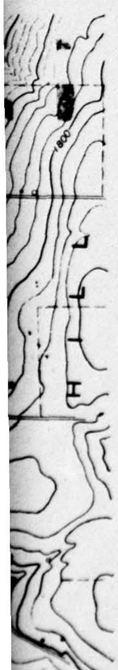
TAILWATER STAGE-DISCHARGE CURVE

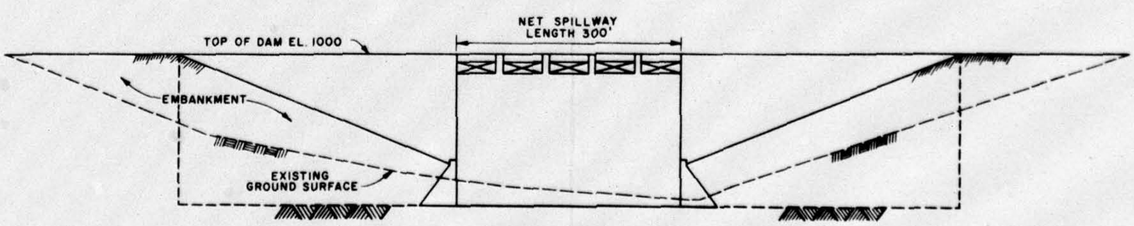


CONCRETE SPILLWAY SECTION

SCALE OF FEET

50' 0 50' 100'





UPSTREAM ELEVATION

SCALE OF FEET

100' 0 100' 200'

LEGEND

- SPILLWAY DESIGN FLOOD POOL EL. 994
- MAXIMUM CONSERVATION POOL EL. 932
- HEAVY DUTY ROAD
- MEDIUM DUTY ROAD
- LIGHT DUTY ROAD
- UNIMPROVED DIRT ROAD
- PROPOSED RELOCATED LIGHT DUTY ROAD

GENESEE RIVER BASIN

COMPREHENSIVE STUDY

NEW YORK AND PENNSYLVANIA

POAGS HOLE, DAM AND RESERVOIR

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE C21

HONEOYE CREEK RESERVOIR

77. LOCATION

The dam site is located on Honeoye Creek approximately 1000 feet upstream from routes 5 and 20. In this area Honeoye Creek is the Livingston and Ontario County line in New York State.

78. PERTINENT DATA

RESERVOIR	
1. Maximum W.S. elev. (Spillway design flood pool)	800
2. Maximum topography, ft.	805
3. Conservation pool, ft.	795
4. Pool area at maximum W.S., Ac.	2240
5. Pool area at conservation pool, Ac.	1340
6. Channel elevation at toe of dam	733
7. Total capacity at conservation pool, Ac. ft.	13,500
8. Total capacity at conservation pool, in.	1 1/3
DAM	
9. Top of dam, elev.	805
10. Top width, ft.	20
11. Height above streambed, ft.	70
12. Length, ft.	780
SPILLWAY	
13. No. of gates	5
14. Size of gates, ft.	50 x 20
15. Top of gates, elev.	795
16. Crest elev.	775
17. Width of spillway chute	280
18. Maximum head on crest (design), ft.	25
19. Design discharge, cfs	102,000
OUTLET WORKS	
20. No. of conduits	2
21. Size of each conduit, $ft.^2$	50
STILLING BASIN	
22. Length, ft.	90
23. Bottom width, ft.	280
24. Elev. of bottom	720
25. Elev. of end of sill	728

79. HYDRAULIC DESIGN

The maximum probable storm was used as a spillway design storm. This storm was developed from the all-season envelope in the U.S. Weather Bureau Report No. 33. The rainfall distribution was arranged in accordance with EM 1110-2-1405, Corps of Engineers. For a drainage area of 189 square miles, the peak discharge from a maximum probable flood would be 118,600 cfs. After being routed through the reservoir the M.P.F. produced a spillway design discharge of 102,000 cfs. The capacity of the conservation reservoir would be 1 1/3 inches. This capacity would be about 2.8 inches if it were assumed that the three large lakes in the basin could be regulated to store all of their respective inflows for a given storm. The controlled, chuted, concrete spillway with a 1V on 4H slope would be located at the left bank. The stilling basin would be rectangular in cross section. The outlet works would be designed for a 2500 cfs discharge under conservation pool conditions (elev. 795). This flow allows a reasonable reservoir draining time but does not exceed bank-full conditions downstream.

80. SUBSURFACE INVESTIGATIONS AND FOUNDATION CONDITIONS

The overburden material consists of massive deposits of glacial drift and it can be assumed that some treatment of the abutments would be necessary to reduce or control seepage. Random fill can be obtained locally and it is believed that impervious fill can be obtained in the general area. Estimated depths to top of bedrock: left abutment, 200 ft., valley, 250 ft., right abutment, 200 ft.

81. DESIGN DETAILS

The proposed rolled earth embankment would have a crest length of approximately 780 feet and would rise about 70 feet above the valley floor. The top width at crest elevation Of 805, would be 20 feet. Both the upstream and downstream slopes of the earth embankment would be IV on 2.5H. It would be assumed that embankment material could be obtained from valley soils. Since it was determined that there was no available rock on which to found a gravity type spillway, a chuted spillway would be constructed at the left bank. The spillway would be regulated by five radial gates which would be 20 feet high by 50 feet long and would be supported by four center piers, 7.5 feet wide. The stilling basin would have a 5-foot thick apron slab. The outlet works would consist of two conduits each controlled by two slide gates. One gate would be in reserve for emergency closure.

82. RELOCATIONS

The reservoir would necessitate the relocation of 1.5 miles of medium duty highway and 52,800 linar feet of 36-inch concrete pipe. See figure C22.

83. LAND REQUIREMENTS

Estimated land requirements for the reservoir at S.D.F. elevation and conservation pool elevation are 2240 acres and 1340 acres respectively. During the time of the 1965 survey, the reservoir at both S.D.F. elevation and conservation pool elevation would require the acquisition of 2 houses, 3 farm units and one business. The reservoir location is shown on figure C22.

84. CONCLUSIONS

The Honeoye Creek site was not included in the basin development plans because of its very unfavorable benefit - cost ratio. All benefits were low or non-existant and bedrock was assumed to be about 200 feet below the ground surface.

85. COST ESTIMATES

This cost estimate is of a preliminary nature and is shown for informational purposes only.

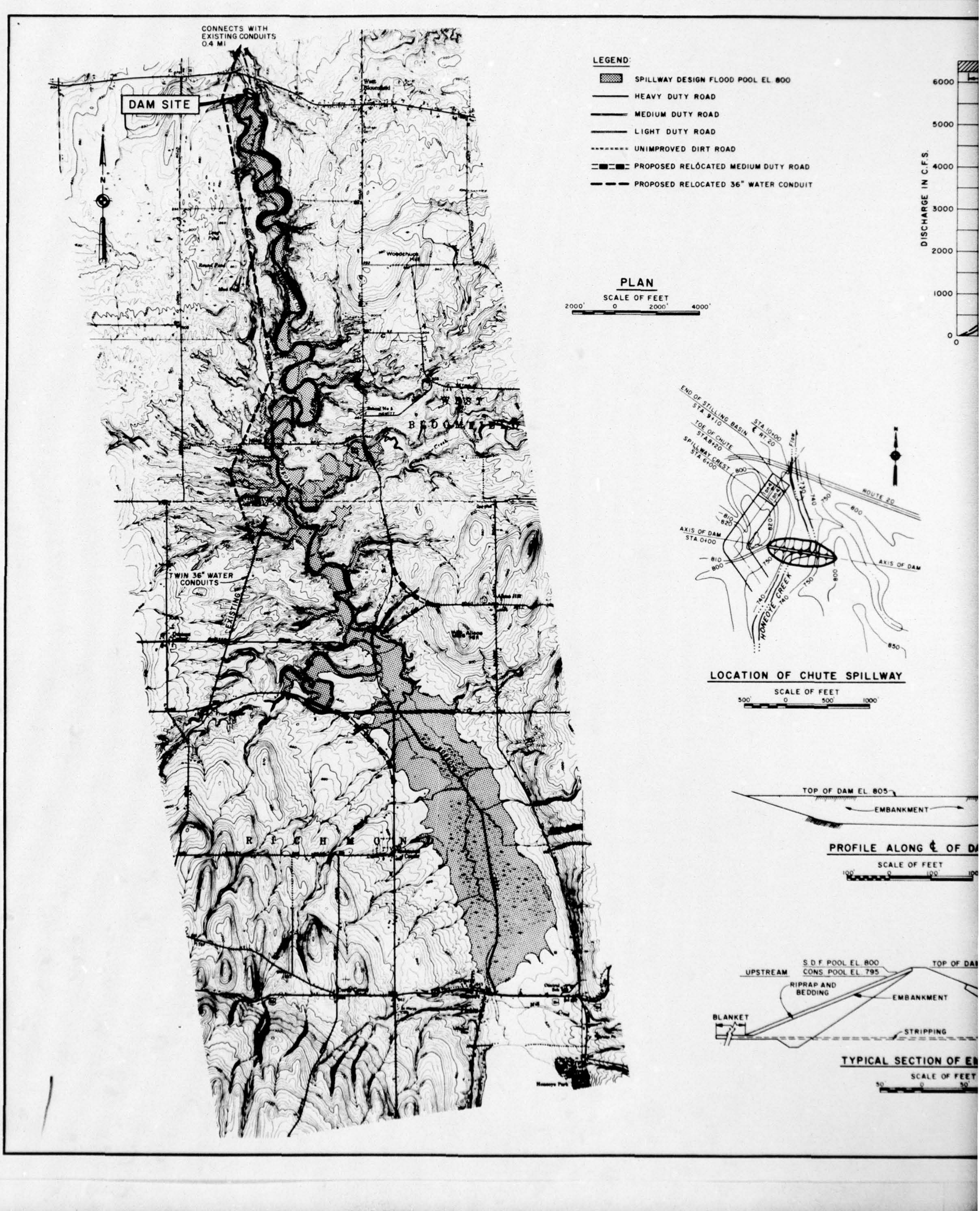
REASONABLE CONTRACT ESTIMATE

SHEET OF

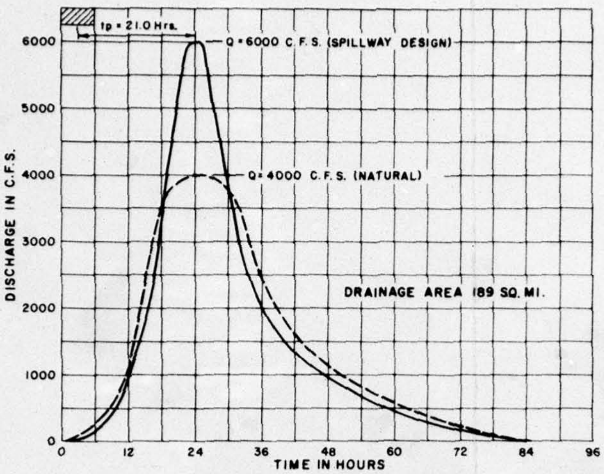
PROJECT: HONEOYE CREEK RESERVOIR (PRELIMINARY)

INVITATION NO.

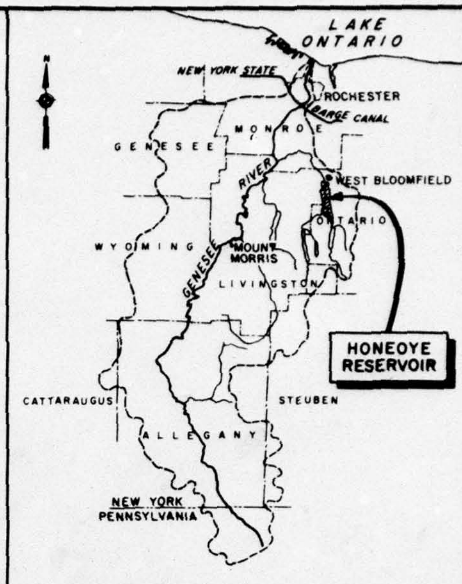
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	DAM & RESERVOIR				
1	Clearing	60	Ac	$ 250	$ 15,000
2	Stripping	53,300	CY	0.75	51,585
3	Excavation - Common	862,000	CY	0.68	586,160
4	Excavation - Borrow	47,000	CY	0.85	39,950
5	Earth Embankment	263,000	CY	0.30	78,900
6	Rock Fill	39,100	CY	4.40	172,040
7	Filter - Sand & Gravel	7,700	CY	3.00	23,700
8	Upstream Blanket	41,000	CY	0.30	12,300
9	Concrete Mass	7,900	CY	27.00	213,300
10	Concrete Reinforced	19,600	CY	36.50	715,400
11	Portland Cement	34,000	Bbl	5.00	170,000
12	Reinforcing Steel	1,200,000	#	0.16	192,000
13	Slide Gates	90	Ton	1,500	135,000
14	Radial Gates & Hoists	375	Ton	2,000	750,000
15	Riprap - Approach Channel	30,000	CY	16.00	480,000
16	Bridge - Outlet	650	SF	50.00	32,500
17	Spillway Bridge	5,600	SF	25.00	140,000
18	Control House		LS		20,000
19	Electrical Work		LS		20,000
20	Cofferdam & Care of Water		LS		50,000
21	Misc. Items		LS		390,000
	TOTAL DAM & RESERVOIR				4,287,835
	Contingencies @ 25% ±				1,012,165
	TOTAL DAM & RESERVOIR				5,300,000
	Relocations				
1	New Medium Duty Highway	1.5	Mi	275,000	412,500
2	36" Concrete Pipe	52,800	LF	19.25	1,016,400
	TOTAL RELOCATIONS				$ 1,428,900
	Contingencies @ 25% ±				371,100
	TOTAL RELOCATIONS INC. CONT.				$ 1,800,000
	TOTAL CONSTRUCTION COSTS				7,100,000
	GOV'T COSTS				
1	Engineering & Design				650,000
2	Supervision & Administration				550,000
	TOTAL GOVERNMENT COSTS				$ 1,200,000
	GRAND TOTAL				$ 8,300,000


CONNECTS WITH
EXISTING CONDUITS
0.4 MI
DAM SITE
N
WEST
BLOOMFIELD
TWIN 36" WATER
CONDUITS
EXISTING
RICHMOND
Honeoye Park
LEGEND:
SPILLWAY DESIGN FLOOD POOL EL 800
HEAVY DUTY ROAD
MEDIUM DUTY ROAD
LIGHT DUTY ROAD
UNIMPROVED DIRT ROAD
PROPOSED RELOCATED MEDIUM DUTY ROAD
PROPOSED RELOCATED 36" WATER CONDUIT
PLAN
SCALE OF FEET
2000' 0 2000' 4000'
DISCHARGE IN C.F.S.
6000
5000
4000
3000
2000
1000
0
0
END OF STILLING BASIN
STA 8+10
STA 10+00
℄ RT 20
TOE OF CHUTE
STA 8+20
SPILLWAY CREST
STA 6+00
ROUTE 20
AXIS OF DAM
STA 0+00
AXIS OF DAM
HONEOYE CREEK
Flow
LOCATION OF CHUTE SPILLWAY
SCALE OF FEET
500' 0 500' 1000'
TOP OF DAM EL 805
EMBANKMENT
PROFILE ALONG ℄ OF DA
SCALE OF FEET
UPSTREAM
S.D.F. POOL EL 800
CONS POOL EL 795
TOP OF DA
RIPRAP AND
BEDDING
EMBANKMENT
BLANKET
STRIPPING
TYPICAL SECTION OF E
SCALE OF FEET

...N FLOOD POOL EL. 800
...OAD
...ROAD
...OAD
...IRT ROAD
...OCATED MEDIUM DUTY ROAD
...OCATED 36" WATER CONDUIT



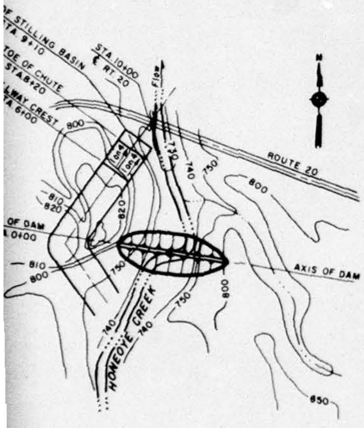
SIX-HOUR UNIT HYDROGRAPHS



LOCATION MAP

SCALE IN MILES

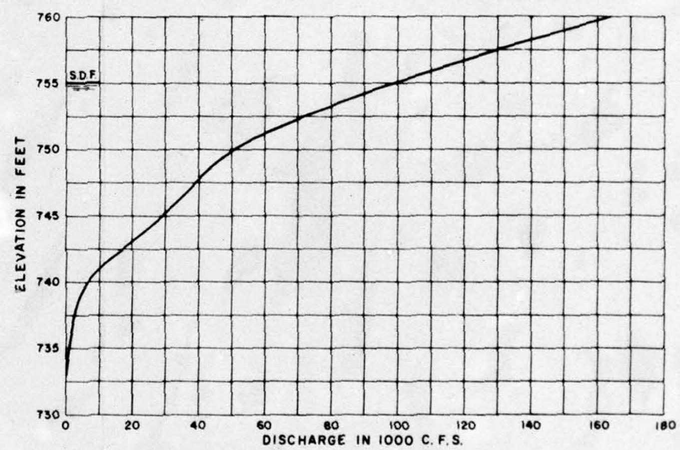
3 0 3 6 9



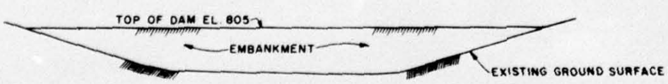
LOCATION OF CHUTE SPILLWAY

SCALE OF FEET

500 0 500 1000



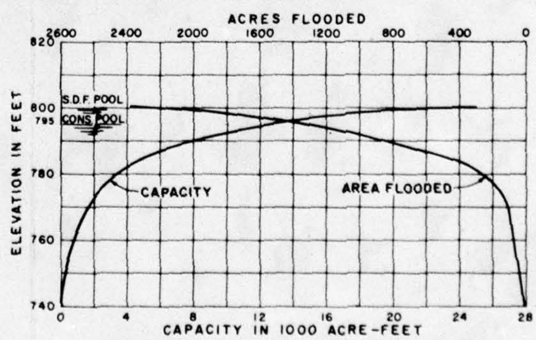
TAILWATER STAGE-DISCHARGE CURVE



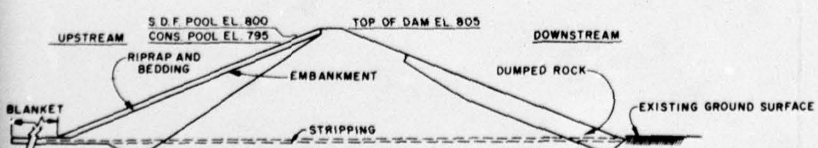
PROFILE ALONG ℄ OF DAM

SCALE OF FEET

100 0 100 200



RESERVOIR AREA AND CAPACITY CURVES



TYPICAL SECTION OF EMBANKMENT

SCALE OF FEET

50 0 50 100

GENESEE RIVER BASIN

COMPREHENSIVE STUDY

NEW YORK AND PENNSYLVANIA

HONEOYE CREEK, DAM AND RESERVOIR

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE C22

OATKA CREEK RESERVOIR

86. LOCATION

The Oatka dam site is located on Oatka Creek in Genesee County, New York about 0.9 miles upstream from the Genesee - Monroe County line and approximately 3.7 miles southwest from Le Roy, New York.

87. PERTINENT DATA

RESERVOIR		
1.	Maximum W.S. elev. (spillway design flood pool)	725
2.	Maximum topography, ft.	730
3.	Conservation pool, ft.	685
4.	Flood control pool, ft.	720
5.	Pool area at maximum W.S., Ac.	890
6.	Pool area at conservation pool, Ac.	640
7.	Pool area at flood control pool, Ac.	865
8.	Channel elevation at toe of dam	619
9.	Total capacity at flood control pool, Ac. ft.	44,500
10.	Total capacity at conservation pool, Ac. ft.	17,600
11.	Total capacity at flood control pool, in.	5
DAM		
12.	Top of dam, elev.	730
13.	Top width, ft.	20
14.	Height above streambed, ft.	110
15.	Length, ft.	1750
SPILLWAY		
16.	No. of gates	4
17.	Size of gates, ft.	40 x 25
18.	Top of gates, elev.	720
19.	Crest elev.	695
20.	Length (effective)ft.	160
21.	Maximum head on crest (design), ft.	30
22.	Design discharge, cfs	88,500
OUTLET WORKS		
23.	No. of conduits	2
24.	Size of each conduit, ft.^{2}	40
STILLING BASIN		
25.	Length, ft.	70
26.	Bottom width, ft. (based on assumed pier width)	190
27.	Elev. of bottom	614
28.	Elev. of end sill	619

88. HYDRAULIC DESIGN

The maximum probable storm was used as a spillway design storm. This storm was developed from the all-season envelope in U.S. Weather Bureau Report No. 33. The rainfall distribution was arranged in accordance with EM 1110-2-1405, Corps of Engineers. For the drainage area of 161 square miles, the peak discharge from a maximum probable flood would be 110,400 cfs. After being routed through the reservoir, the M.P.F. produced a spillway design discharge of 88,500 cfs. The gated concrete spillway would be an ogee-shaped weir with a vertical upstream face. The stilling basin would be rectangular in cross section and would have a 5-foot thick apron. The outlet works would be designed for a 4400 cfs discharge under full pool conditions. This flow allows a reasonable reservoir draining time but does not exceed bank-full conditions. To contain the spillway design flood within the reservoir area, five dikes numbered 1 through 5 would be required with crests at elevation 730. See figure C23. Relief culverts would be needed in the dikes numbered 2 and 5 for the flood control reservoir as follows:

#2... Two 2'x2' concrete box culverts.
#5... Two 5'x5' concrete box culverts.

Sluice gates will be necessary on all culverts, on the reservoir side of the dikes.

89. SUBSURFACE INVESTIGATIONS AND FOUNDATION CONDITIONS

The overburden on the abutments consists of glacial drift varying in thickness from 30 feet on the left abutment to about 15 feet on the right abutment. On the level ground between abutments, much of it is soft, wet muck and varies in depth from about 10 to 20 feet. Bedrock has been observed in the creek bed. Random and impervious fill and bedding materials are available locally.

90. DESIGN DETAILS

The proposed rolled earth embankment would have a crest length of approximately 1750 feet and would rise about 110 feet above the valley floor. The crown width at top elevation of 730 would be 20 feet. Both the upstream and downstream slopes of the earth embankment would be IV on 2.5H. The 4740 feet of dikes involved have a crest width of 10 feet and side slopes of IV on 2.5H. It would be assumed that embankment material could be obtained from valley soils. The concrete spillway would be founded on rock at the center of the valley. The spillway would be controlled by four radial gates which would be 25 feet high

by 40 feet long and would be supported by three center piers, 10 feet wide. The stilling basin would be founded on rock and would have a 5-foot thick apron slab. The outlet works would consist of two conduits each controlled by two slide gates. One gate would be in reserve for emergency closure.

91. RELOCATIONS

The reservoir would necessitate the relocation of the following:

3.5 miles of medium duty highway
1.5 miles of heavy duty highway
1.0 mile of light duty highway

92. LAND REQUIREMENTS

Estimated land requirements for the reservoir at S.D.F. elevation and conservation pool elevation are 890 acres and 640 acres respectively. During the time of the 1965 survey, the reservoir at the S.D.F. elevation would require the acquisition of 34 parcels of land with buildings. At conservation pool elevation, the acquisition of 27 parcels of land with buildings. The reservoir location is shown on figure C23.

93. CONCLUSIONS

The Oatka site was not included in the basin development plans because the benefits were primarily from Recreation and Fish and Wildlife. Although these benefits are relatively high, it is a Corps policy that no more than 50 percent of Recreation and Fish and Wildlife benefits may be used to justify the feasibility of a project. Under these conditions, the benefit - cost ratio was not favorable.

94. COST ESTIMATES

This cost estimate is of a preliminary nature and is shown for informational purposes only.

REASONABLE CONTRACT ESTIMATE

SHEET 1 OF 2

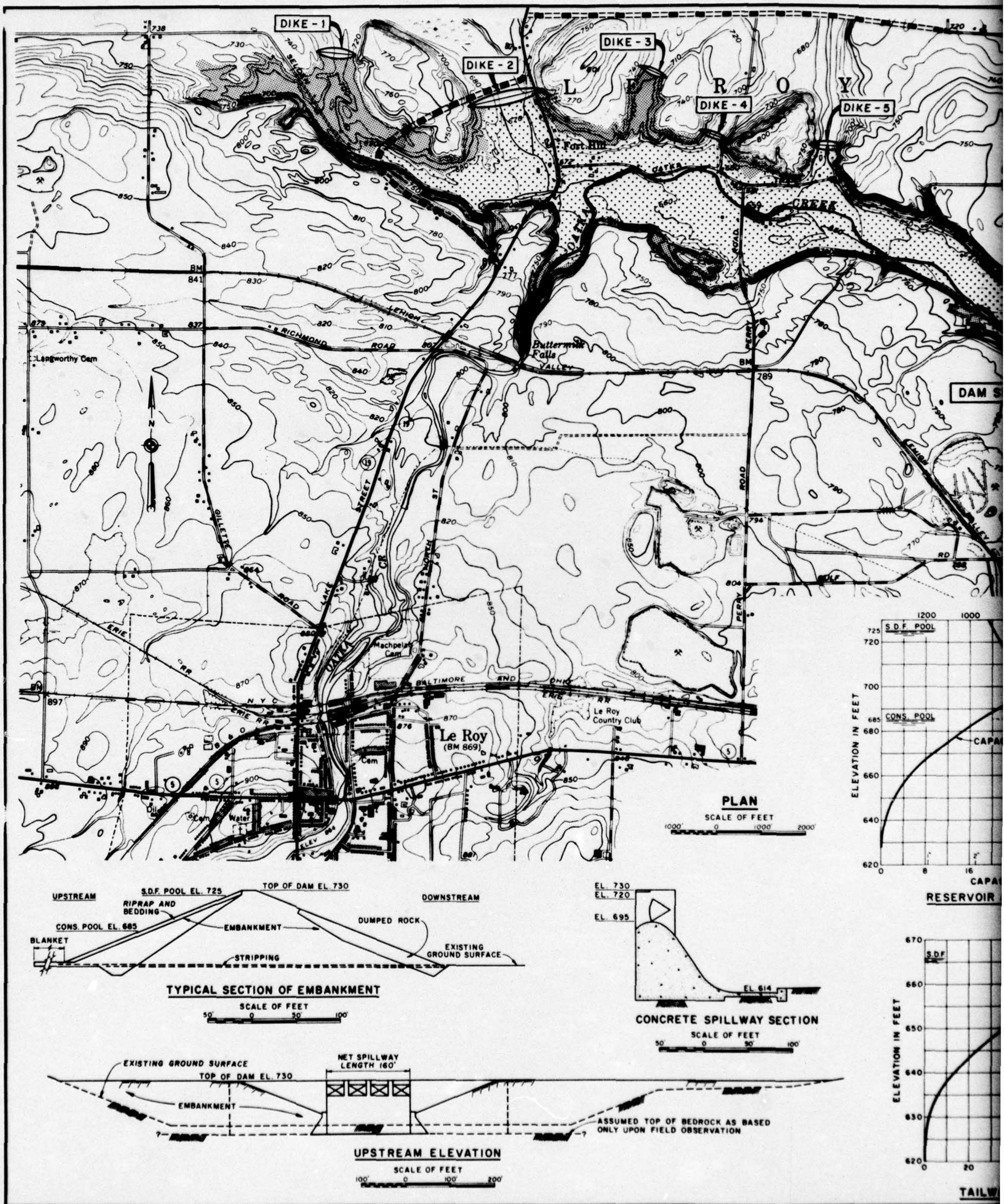
PROJECT: OATKA CREEK RESERVOIR - GENESEE RIVER BASIN - DAM SITE 3A

INVITATION NO.: June 14, 1965

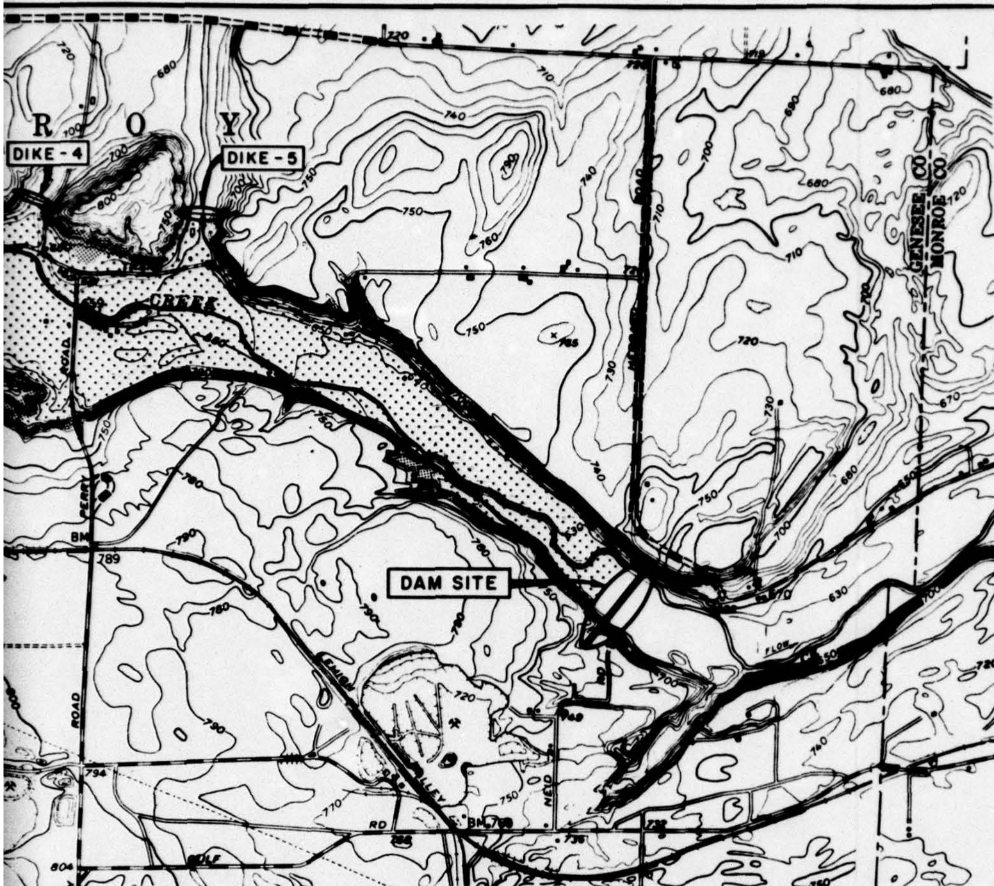
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
1	Clearing Reservoir Area	700	Ac	$ 200.00	$ 140,000
2	Clear & Grab Dam Site	40	Ac	450.00	18,000
3	Stripping	348,000	CY	0.70	243,600
4	Common Excavation	150,000	Cy	0.85	127,500
5	Borrow Excavation	2,400,000	CY	0.50	1,200,000
6	Rock Excavation	17,000	CY	4.10	69,700
7	Rock Fill	200,000	CY	4.00	800,000
8	Earth Embankment	1,875,000	CY	0.16	300,000
9	Filter, Sand & Gravel	46,000	CY	3.00	138,000
10	Upstream Blanket	332,000	CY	0.16	53,120
11	Concrete-Mass	137,000	CY	20.00	2,740,000
12	Concrete-Reinforced	7,100	CY	45.00	319,500
13	Portland Cement	145,000	Bbl	5.00	725,000
14	Reinforcing Steel	430,000	#	0.16	68,800
15	Spillway Bridge	3,800	SF	25.00	95,000
16	Radial Gates	224	Ton	1,500	336,000
17	Radial Gate Hoists	58	Ton	2,500	145,000
18	Slide Gates	176	Ton	1,500	264,000
19	Misc. Items (10% ± of above) (7,783,220)		LS		800,000
20	Control House		LS		10,000
21	Electrical Work		LS		20,000
22	Cofferdam & Care of Water		LS		50,000
	TOTAL DAM COSTS				$ 8,663,220
	Contingencies @ 25% ±				2,136,780
	TOTAL DAM COSTS INC. CONTINGENCIES				$ 10,800,000

PRELIMINARY

REASONABLE CONTRACT ESTIMATE					SHEET 2 OF 2
PROJECT OATKA CREEK RES.-GENESEE RIVER BASIN-DAM SITE 3A (PRELIMINARY)					INVITATION NO.
ITEM NO.	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
	RELOCATIONS				
1	Stripping	60,000	CY	$ 0.70	$ 42,000
2	Rock Fill	31,000	CY	4.00	124,000
3	Earth Embankment	232,000	CY	0.16	37,120
4	Borrow Excavation	265,000	CY	0.50	132,500
5	Concrete Reinforced	200	CY	80.00	16,000
6	Concrete Pipe 42"	120	LF	21.00	2,520
7	Concrete Pipe 24"	120	LF	9.50	1,140
8	Highways Improved				
	Medium Duty	2.5	Mi	70,000	175,000
9	Highways New				
	Heavy Duty	1.5	Mi	400,000	600,000
10	Highways New				
	Medium Duty	1.0	Mi	275,000	275,000
11	Highways New				
	Light Duty	1.0	Mi	200,000	200,000
	TOTAL RELOCATIONS				$ 1,605,280
	Contingencies @ 25% ±				394,720
	TOTAL RELOCATIONS INC. CONTINGENCIES				$ 2,000,000
	TOTAL DAM COSTS INC. CONT.	10,800,000			
	TOTAL RELOCATIONS INC. CONT.	2,000,000			
	GOV'T COSTS				
	Engineering & Design 1,000,000				
	Super. & Admin. 900,000				
	TOTAL GOV'T COST	1,900,000			
	GRAND TOTAL				$ 14,700,000

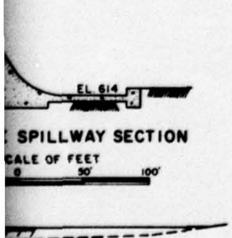


DIKE - 1
DIKE - 2
DIKE - 3
DIKE - 4
DIKE - 5
L E R O Y
Fort Hill
OATKA CREEK
Buttermilk Falls
RICHMOND ROAD
LEHIGH VALLEY
Lapworthy Cem
GILLETTE ROAD
LAKE STREET
NORTH ST
PERRY ROAD
GOLF RD
DAM S
ERIE RR
BALTIMORE AND OHIO
N Y C
Machpelah Cem
Le Roy Country Club
Le Roy
(BM 869)
Cem
Water
PLAN
SCALE OF FEET
1000' 0 1000' 2000'
UPSTREAM
S.D.F. POOL EL. 725
TOP OF DAM EL. 730
DOWNSTREAM
RIPRAP AND BEDDING
CONS. POOL EL. 685
EMBANKMENT
DUMPED ROCK
BLANKET
EXISTING GROUND SURFACE
STRIPPING
TYPICAL SECTION OF EMBANKMENT
SCALE OF FEET
50' 0 50' 100'
EL. 730
EL. 720
EL. 695
EL. 614
CONCRETE SPILLWAY SECTION
SCALE OF FEET
50' 0 50' 100'
EXISTING GROUND SURFACE
NET SPILLWAY LENGTH 160'
TOP OF DAM EL. 730
EMBANKMENT
ASSUMED TOP OF BEDROCK AS BASED ONLY UPON FIELD OBSERVATION
UPSTREAM ELEVATION
SCALE OF FEET
100' 0 100' 200'
S.D.F. POOL
CONS. POOL
ELEVATION IN FEET
CAPA
RESERVOIR
S.D.F.
TAILW



PLAN

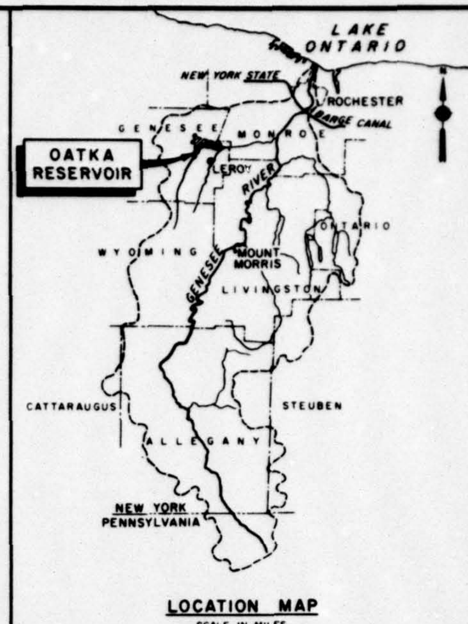
SCALE OF FEET
0 1000' 2000'



SPILLWAY SECTION

SCALE OF FEET
0 50' 100'

...ROCK AS BASED
...ERVATION

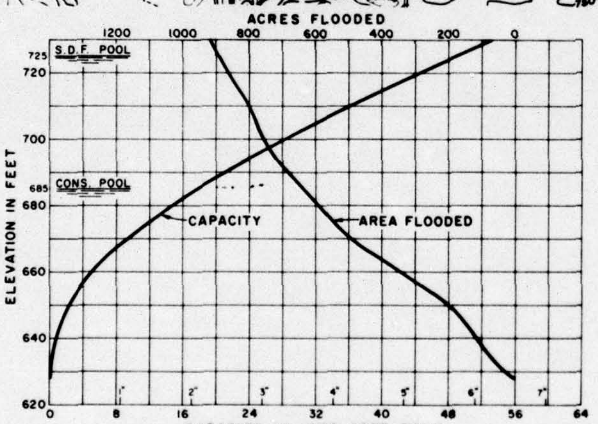


LOCATION MAP

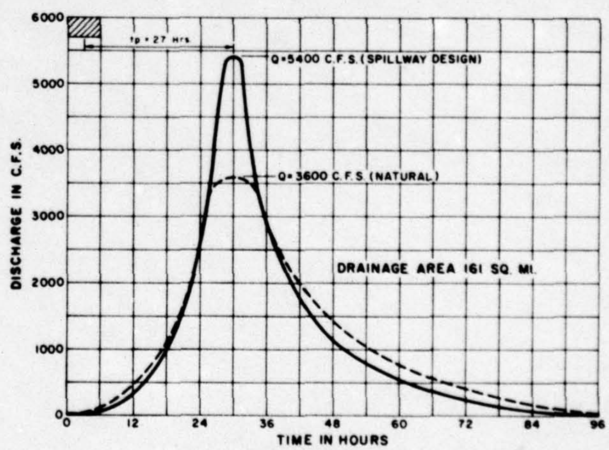
SCALE IN MILES
3 0 3 6 9

LEGEND:

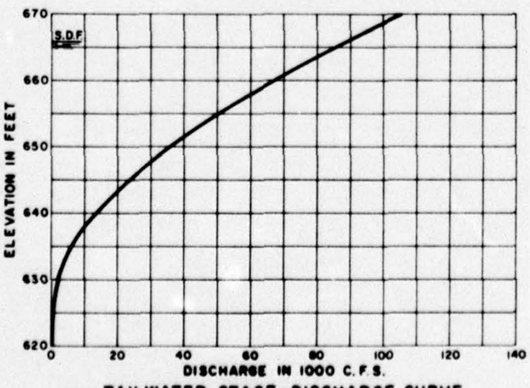
- SPILLWAY DESIGN FLOOD POOL EL. 725
- MAXIMUM CONSERVATION POOL EL. 685
- HEAVY DUTY ROAD
- MEDIUM DUTY ROAD
- LIGHT DUTY ROAD
- UNIMPROVED DIRT ROAD
- PROPOSED RELOCATED HEAVY DUTY ROAD
- PROPOSED RELOCATED MEDIUM DUTY ROAD



RESERVOIR AREA AND CAPACITY CURVES



SIX-HOUR UNIT HYDROGRAPHS



TAILWATER STAGE-DISCHARGE CURVE

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

OATKA CREEK, DAM AND RESERVOIR

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

FIGURE C23

GENESEE RIVER BASIN COMPREHENSIVE STUDY

APPENDIX C

SECTION IV - LOCAL PROTECTION PROJECTS

1. GENERAL

Reports have been completed for several local protection projects in the Genesee River Basin. The justified and recommended projects are: Red Creek in the towns of Brighton and Henrietta; Oatka Creek in the village of Warsaw; and the Genesee River, including Dyke Creek, in the village of Wellsville. The recommended plans of improvement for these projects are briefly discussed in paragraphs 57 through 59 of Appendix F. As indicated in paragraph 62 of Appendix F, a study for local protection at the confluence of Black Creek and the Genesee River in the town of Chili could not produce a justifiable improvement. Another local protection projection project being considered is Canaseraga Creek in Livingston County. Results of this study are discussed in the following paragraphs.

CANASERAGA CREEK LOCAL PROTECTION PROJECT

2. GENERAL

Canaseraga Creek is the largest tributary of the Genesee River with a drainage area of 335 square miles at the mouth. It is located in the Lower Genesee Basin and joins the Genesee River about 4 miles downstream of Mount Morris Dam. Streams tributary to Canaseraga Creek include Mill, Sugar and Slader Creeks and Stony Brook in the upper reaches of the basin and Keshequa and Bradner Creeks in the lower reaches. Keshequa Creek, with a drainage area of 76 square miles, is the largest stream tributary to Canaseraga Creek. The Canaseraga Basin, designated Subwatershed 13 for this comprehensive study, is shown on plate E1 of Appendix E.

3. The Canaseraga Creek Basin approximates a square of about 20 miles on a side. The upper reaches of the basin are steep and rugged with a main stem slope of about 40 feet per mile. The lower valley, from Dansville downstream to the confluence with the Genesee River, is a flat alluvial plain with a main stem slope of about 3 feet per mile. Plate E2 of Appendix E, a profile along the 42 miles of Canaseraga Creek, indicates the drastic change in topography between the upper and lower reaches of the basin. The creek, rising at about elevation 1900, joins the Genesee River at river mile 63 at about elevation 548.

4. DESCRIPTION OF THE PROBLEM AREA

The area studied, a broad, flat plain known as the Canaseraga Valley, extends from Woodsville, New York downstream to the Genesee River. The valley is about 15 miles in length and varies from one to three miles in width. Canaseraga Creek meanders through the valley in a generally northwesterly direction. Keshequa and Bradner Creeks are two tributaries of Canaseraga Creek whose confluences are in the Canaseraga Valley. The project location is shown on plate C1. The study area is shown on plate C2.

5. The Canaseraga Valley, a rich agricultural area, is inundated to some extent annually by streamflow exceeding the channel capacity in the upper reaches of the valley and poor local drainage in the lower reaches. This poorly drained area provides habitat where thousands of waterfowl stop during their spring migration. Flood damages in the valley are agricultural consisting of crop and pastureland losses as well as other on farm losses such as fences and roads. The drainage problem in the lower reaches of the valley is the result of very flat gradients, the top of creek banks generally being higher in elevation than the surrounding farm lands, and limited waterway openings under road and railroad embankments of considerable height that traverse the valley. These conditions cause ponding from State Route 408 at Shakers Crossing upstream to West Sparta. The outline of the ponding area for the April 1961 flood, a 5-year event on an annual basis, is shown on plates F14 and F15 of Appendix F. Inundation of this area has been known to last for several months, as was the case after the 1961 flood. Ponding caused by spring floods prevents early planting thereby limiting the type of crops that can be grown because of the shorter growing season. Ponding as a result of summer flooding causes extensive damage because truck garden crops that have been planted are destroyed when inundated for an extended period.

6. Overland flooding, due to limited channel capacity, occurs in the upper reaches of the valley. The area that was affected by overland flooding during the April 1961 flood is shown on plate F15. Overbank flow on Canaseraga Creek occurs just downstream of Cumminsville at a flow of about 3000 cfs. The Dansville and Mount Morris Railroad embankment prevents the overbank flow from re-entering Canaseraga Creek further downstream while the high banks along Bradner Creek prevent the overbank flow from entering Bradner Creek. The result is flooding over the area west of the Dansville and Mount Morris Railroad for Canaseraga Creek discharges in excess of 3000 cfs. This is about a 1-year event on an annual basis as shown on plate C12

and a 3-year event on a summer basis as can be seen from the discharge-frequency curves on plate C13. The summer event discharge frequency curves are discussed in paragraph C34. High discharges on Bradner Creek, in addition to high tailwater on Canaseraga Creek that affects the stage on Bradner Creek, contribute to the flooding of this area. Winter and spring overland flooding of the upper end of the valley would damage pastureland and nursery stock while flooding due to summer storms would also damage truck garden crops. However, the flood damage to the crops on a given acreage would not be as intensive as that occurring in the ponding area since the area would not be inundated for an extended period of time. Overland flooding from Canaseraga Creek also occurs in the area east of the Dansville and Mount Morris Railroad embankment and upstream of State Route 258 at Groveland Station. The high left bank of Canaseraga Creek downstream of the section where overbank flooding occurs prevents the overbank flow from returning to Canaseraga Creek. The overbank drainage is in the direction of the railroad embankment and the overland flow eventually enters the ponding area thereby contributing to the ponding problem.

7. EXISTING IMPROVEMENTS

The Mount Morris flood-control reservoir, a Federal project that went into operation in November 1951, has significantly reduced flooding in the lower reaches of the Canaseraga Valley from its confluence with the Genesee River upstream to Keshequa Creek. Prior to this project, high tailwater conditions on the Genesee River caused backup into the Canaseraga Valley and resulted in inundation of a portion of the lower valley.

8. A Federal clearing and snagging project on Canaseraga Creek from its mouth to Groveland Station was completed in 1954. This project improved conditions on and in the immediate vicinity of the main stem but the obstructed conditions on the tributary channels precluded any general reduction in either the scope or duration of flooding.

9. Local property owners have provided a realignment of about 5 1/2 miles of Canaseraga Creek from just downstream of Groveland Station upstream to near White Bridge to improve flow conditions in this reach. Another realignment project is in the vicinity of Keshequa Creek. It consists of 1 1/4 miles of channel. The State of New York constructed a canal in the area to the west of Bradner Creek to improve local drainage. The 4 miles of this canal, in addition to the other improvements discussed above, are shown on plate C10. A system of lateral ditches have been constructed throughout the valley by the local owners to improve the drainage from their farmlands.

10. PRIOR REPORTS

The survey report on the Genesee River, submitted to Congress 16 May 1944 and subsequently published in House Document No. 615, 78th Congress, 2nd Session, upon which authorization of the Mount Morris project was based, resulted in unfavorable recommendations of projects at certain points on Canaseraga Creek.

11. A report titled "Review of Report on Genesee River, New York, Vicinity of Dansville," dated 30 July 1945 and subsequently published in House Document No. 206, 80th Congress, 1st Session, produced an economically justified project. A project, consisting of channel improvement with a flood wall and levee system, was authorized as a result of this report.

12. The above authorized project was placed in an inactive status as per recommendation of the report titled "Report on Economic Studies for Design Memorandum on Local Flood Protection at Dansville and Vicinity, Canaseraga Creek, New York," submitted to OCE on 11 October 1956. It was determined at that time that the project could no longer be justified.

13. SOLUTIONS CONSIDERED

The flood problem in the area studied is agricultural in nature. Due to the drainage problem in the study area, any improvement contemplated must consider channel improvement in the study area to control local flows.

14. Reservoir control of flood waters originating in the Canaseraga Creek watershed was considered. Sites at Poags Hole in Canaseraga Creek upstream of Dansville and downstream of Tuscarora, New York on Keshequa Creek were investigated. These sites could not provide the required protection when considered separately because of the small drainage area controlled by each. When considered jointly, channel improvement would still be required in the study area of the Canaseraga Valley to obtain the desired protection. In any event, reservoir control was not considered justifiable for protection of the Canaseraga Valley flood area. Further discussion of the reservoir sites can be found in Section III of this appendix.

15. Stream diversion, or similar types of remedial measures, was not considered feasible so was not given consideration during this study. Consequently, the study was concentrated on provision of protection in the immediate problem area utilizing channel improvement by straightening and enlargement, construction of levees and enlargement of waterway openings through bridges.

16. PROJECT PURPOSES

The proposed plan of improvement would provide for multipurpose benefits from flood control and recreation. The flood control benefits would be agricultural consisting of benefits due to reduction of flood damages and changed land use and intensified land use benefits. The recreational benefits would be realized from fish and wildlife useage and would result from provision of ponding areas in the study area to be used as nesting and rearing grounds for waterfowl during the summer season and resting and feeding grounds during the fall migration. Additional recreational benefits would result from increased bird-watching opportunity and increased waterfowl hunting opportunity.

17. PLAN OF IMPROVEMENT

Basis of Design - The plan of improvement was designed to:

(1) Protect the Canaseraga Valley from Shakers Crossing upstream to White Bridge from flooding from the 5-year discharge on the "summer event" basis;

(2) Sufficiently reduce the duration of flooding in the existing ponding area upstream of Keshequa Creek to assure the farmers the use of this land by a certain date a certain percentage of the years; and

(3) Provide a control at the lower end of the improvement to limit the discharge from the valley to that discharge that would have occurred under existing conditions and thereby produce no greater damage on the lower Genesee Basin due to discharge from Canaseraga Creek than would have occurred under existing conditions. The improvement was designed on the "summer events" basis since the major portion of the flood damages is the result of summer flooding and the related agricultural benefits from changed land use and more intensive land use results from acreage of crop land that would be protected against summer flooding. Derivation of the "summer events"

discharge-frequency curve is discussed in paragraph 34 of this section and the discharge-frequency curves are shown on plates C13 and C14. The reduction in duration of flooding in the existing ponding area would result from the improvements made to provide for at least a 5-year protection in the study area. Features of the project plan are shown on plate C2.

18. <u>Description of Improvement</u> - The plan would include the following features:

(1) Enlargement and realignment of channels for approximately 15 miles along Canaseraga Creek, 4,050 feet along Keshequa Creek, 6,900 feet along Bradner Creek and 3,900 feet along the State Canal, a stream tributary to Bradner Creek. Every effort will be made to leave the existing oxbows in their natural condition and have the hydraulics of the realignment such that the oxbows will contain water, even during periods of low flow.

(2) Replacement of 3 service bridges for farm vehicles, removal of 3 service bridges for farm vehicles, replacement of the Pioneer Road bridge over Bradner Creek and the Everman Road bridge over Canaseraga Creek.

(3) Construction of 6,700 linear feet of levee along the left bank of Canaseraga Creek upstream of White Bridge at the upstream limits of the improvement.

(4) Construction of sheet pile control structures on Canaseraga and Keshequa Creeks, 2 sheet pile weirs on Canaseraga Creek and a sheet pile weir on Bradner Creek.

(5) Construction of a retention structure across the valley downstream of Keshequa Creek. It would consist of an earth embankment 12,500 feet in length, a gated spillway to regulate flows from storms of the 100-year magnitude and a protected overflow section to pass flows from storms of the standard project storm magnitude without breaching the embankment. Material excavated from the channels would be used for the retention structure and levee embankments and for uncompacted fill in low areas adjacent to the channels.

(6) Provision of Fish and Wildlife ponds on the right and left banks of Canaseraga Creek in the area upstream of the confluence with Keshequa Creek. The ponds are shown on plate C10. Earth embankments, utilizing the material excavated from the channels, would provide for retention in the areas designated Permanent Pond I and Permanent Pond II. These ponds would be filled to the permanent pool elevations during the spring runoff period through gated conduits and the permanent pool elevations would be maintained through the summer months using pumps to replenish the losses due to evaporation and

seepage. Temporary Pond III would be formed during filling of the permanent ponds and would not require any structures. It would be drained utilizing the gated spillway every spring prior to 15 May to make the area available for planting.

19. Channel enlargement would generally follow alignments of existing channels except where bends could be corrected to provide more efficient flow conditions. The proposed channel realignments are shown on plate C2. The realignment of Canaseraga Creek from State Route 408 upstream to near the proposed retention structure provides a reduction in channel length of 7,800 feet. The proposed alignment for this area would not only provide a more efficient design, but would be more economical because of the friction losses in the addition 7,800 feet of channel that would have to be made up by lowering the thalweg, riprap required on the sharp bends on the existing alignment, the maintenance cost of the additional 7,800 feet of channel and enlargement of 7,800 feet of existing channel.

20. Improved channels would be trapazoidal with side slopes of 1 vertical on 2 1/2 horizontal. Plates C3 through C8 are profiles along Canaseraga, Keshequa and Bradner Creeks and the State Canal showing the improved thalweg, bottom widths, design water surface profiles and channel slopes. Because of the nature of the soils, the improved channels were designed to limit the velocities to 4.5 feet per second at design flows. Riprap protection would be provided upstream and downstream of bridges, control structures and weirs, and in the improved channels at locations where the velocity exceeded 4.5 feet per second at design discharge.

21. The proposed improvement would require bridge work at the locations shown on plate C2. Table C5 lists the bridges.

TABLE C5. - Bridges over Canaseraga Valley channels requiring improvement.

Bridge No.	Channel	Station	Description of Crossing
1	Canaseraga Creek	179+60	5-span farm bridge (1)
2	Canaseraga Creek	251+40	4-span farm bridge (2)
3	Canaseraga Creek	627+60	Farm bridge (2)
4	Canaseraga Creek	654+00	Farm bridge (1)
5	Canaseraga Creek	734+90	Farm bridge (2)
6	Canaseraga Creek	747+00	Farm bridge (1)
	Canaseraga Creek	694+50	2-span highway bridge at Everman Road (1)
	Bradner Creek	2+50B	2-span highway bridge at Pioneer Rd. (1)

(1) Replace existing structure.

(2) Remove existing structure.

22. The proposed levee on Canaseraga Creek upstream of White Bridge was designed to provide 2 feet of freeboard over the 10-year "summer events" stage. Overflow in this area causes most of the agricultural damages in the upper reaches of the valley and contributes to the ponding problem in the lower reaches of the valley. The direction of drainage behind the levee would be away from the creek, therefore internal drainage need not be considered.

23. Control structures and weirs would be constructed at several locations to reduce the quantity of excavation required for the improvement. A plan utilizing friction channels as an alternate to the control structures would produce a first cost comparable to that for the control structures but maintenance costs for the friction channels would be excessive. The location of the control structures and weirs are shown on plate C2 and are indicated on the profiles on plates C3 through C8.

24. A retention structure would be constructed downstream of the confluence of Keshequa Creek. This location, shown on plate C2, would provide control of flows into the Genesee River from the 76 square mile drainage area of Keshequa Creek in addition to controlling the Canaseraga Creek flows. An elevation along the axis of the structure, along with sections through the embankment, spillway and overflow section, is shown on plate C9. The purpose of the control structure would be to control the outflow from Canaseraga and Keshequa Creeks into the Genesee River. Uncontrolled flow from this area would produce damaging stages on the lower Genesee River at a recurrence interval of about once in 2 1/2 years on an annual events basis. Coincident discharge on the lower Genesee from local runoff would further increase the frequency of flooding on the lower Genesee. The storage capacity of the reservoir behind the structure would be sufficient to: limit the discharge into the Genesee River to a non-damaging discharge for storms of the 100-year magnitude on the Canaseraga Basin; and limit the discharge into the Genesee to that discharge that would have occurred under existing conditions for extensive storms that would produce high local discharges on the lower Genesee in addition to high flows on the Canaseraga. The reservoir conditions that would exist for the 100-year flood event, including the inflow hydrograph, spillway discharge hydrograph and reservoir stage, are shown on plate C9.

25. PAST FLOODS

The banks of Canaseraga Creek in the Canaseraga Valley are overflowed almost every year causing agricultural damage. Flooding of the area in the upper reaches of the basin from Cumminsville upstream is relatively infrequent due to the steep channel slopes and high banks. The flood of March 1913, for which records of discharge are not available, inundated the hamlet of Cumminsville to a depth of about 2 feet. For the storm of July 1940, producing the greatest discharge ever recorded at the U.S. Geological Survey gaging station at Dansville, the only significant damage reported in the upper reaches occurred on the property of the Foster Wheeler Corporation located in Cumminsville. Other storms have produced only minor damages in the upper reaches of the basin.

26. The large floods of record on the Genesee River Basin are listed and described in paragraph 16 of Appendix E. Effects of these floods on the Canaseraga Valley are discussed briefly. As indicated in paragraph 16, the floods of March 1865, June 1889, May 1894, April 1896, March 1902, July 1902, March 1913, May 1916, December 1927, July 1935, and April 1961 caused considerable inundation of the Canaseraga Valley. The storm of April 1961, producing peak discharges of 8,230 and 4,110 cfs at Dansville and Shakers Crossing respectively, caused extensive inundation and duration of flooding in the Canaseraga Valley. The isohyetal pattern of this storm as determined for the Genesee River Basin is shown on plate E11 of Appendix E. A detailed study of this storm was made for the Canaseraga Basin as it was the most severe storm on the basin for which discharge records at Dansville and Shakers Crossing were available. The flood hydrograph at Shakers Crossing for the April 1961 storm is shown on plate E17. Table E6 of Appendix E lists the recorded maximum discharges at the gage sites in the Canaseraga Basin.

27. UNIT HYDROGRAPHS

A synthetic inflow unit hydrograph was derived for the ponding area upstream of Shakers Crossing. Unit hydrographs derived for the areas upstream of the Dansville gage and Keshequa Creek at the mouth, in additiom to unit hydrographs for two local areas upstream of Shakers Crossing were combined to produce the composite inflow unit hydrograph for the ponding area. The resulting inflow unit hydrograph was then routed through the ponding area to produce an outflow unit hydrograph for Shakers Crossing. The unit hydrograph at the Dansville gage was determined by averaging the unit hydrographs as determined from the discharge hydrographs at the gage for the March 1953,

April 1958 and April 1961 storms. Snyder's synthetic method was used to determine the unit hydrograph on Keshequa Creek at Sonyea. The Taylor-Schwarz method, described in paragraph 16A of the Detailed Hydrology Attachment of Appendix E, was used to determine the synthetic unit hydrographs for the two local areas. The inflow unit hydrograph to the ponding area was tested by applying the rainfall excess from the April 1961 storm to the unit hydrograph and routing the resulting storm hydrograph through the ponding area. The routed outflow hydrograph was in agreement with the recorded hydrograph at the Shakers Crossing gage for the April 1961 storm. The 6-hour inflow and outflow unit hydrographs at Shakers Crossing are shown on plate C11.

28. The inflow unit hydrograph at Shakers Crossing was used to: (1) Establish flows into the ponding area upstream of Shakers Crossing as a basis for the design of the retention structure; (2) Establish flows into the ponding area as a basis for the determination of stage-frequency relationships for the reaches in the ponding area; and (3) Establish flood discharges within the Canaseraga Creek Basin due to the standard project flood.

29. STANDARD PROJECT FLOOD

A standard project flood estimate for the Canaseraga Creek basin was prepared in accordance with paragraph 1-69 of EM 1120-2-101 and Civil Works Engineer Bulletin No. 52-8, ENGWE dated 26 March 1952, reprinted June 1964, and was forwarded by letter dated 9 February 1967 through NCD to Office, Chief of Engineers and approved by OCE by 2nd Indorsement on 5 April 1967.

30. The standard project flood determination was done using Corps of Engineers computer program 23-J2-J228, "Unit Graph and Hydrograph Computations," prepared by the Hydrologic Engineering Center, Sacramento. This program computes the standard project storm and standard project flood in accordance with Bulletin 52-8. The standard storm pattern of Bulletin 52-8 was oriented to give the greatest concentration of rainfall over the Canaseraga Creek Basin. It was determined that this orientation would cause more severe flooding in the basin than if oriented to give the greater concentration of rainfall over the entire Genesee River Basin.

31. Neither levee heights nor channel capacities were designed to provide protection against the standard project flood. However, the proposed retention structure upstream of Shakers Crossing was designed to pass the standard project flood flows without breaching the embankment. Using criteria established in Engineer Circular 1110-2-27 titled "Policies and Procedures

Pertaining to Determination of Spillway Capacities and Freeboard Allowances for Dams," dated 1 August 1966 and a paper in the Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers titled "Hydrology of Spillway Design; Large Structures-Adequate Data," by Franklin F. Snyder and dated May 1964, it was considered that the standard project flood would be adequate as the Spillway Design Flood for the proposed retention reservoir. In the basic letter of 9 February 1967 to O.C.E., it was requested that the standard project flood for Canaseraga Creek at Shakers Crossing be approved as the Spillway Design Flood for the proposed retention structure. In reply by 2nd Indorsement, O.C.E. stated that based on the information presented the standard project flood was considered appropriate for use as the Spillway Design Flood for the retention structure provided that results of detailed design and economic studies support the selection. The peak inflow to the ponding area for the standard project flood was determined to be 126,000 cfs. Under existing conditions, storage in the valley would reduce the peak discharge to about 90,000 cfs and the proposed retention structure would further reduce the peak discharge to about 88,000 cfs.

32. DISCHARGE-FREQUENCY FOR CANASERAGA CREEK

Discharge-frequency curves were determined on an "annual events" and a "summer events" (May through October) basis. Separate curves were developed for several reasons. First, determination of floodwater damages under existing conditions necessitated use of the "annual events" discharge-frequency curves. Determination of these damages on a less severe basis would have resulted in average annual values considerably less than are occurring in the area. Second, "annual events" curves were required to determine storage requirements for the reservoir behind the proposed retention structure. The "summer events" discharge-frequency curves would be required to determine the benefits attributable to the Changed Land and Intensified Land Uses that are discussed in paragraphs 71 through 73. Since the damages in the study area are agricultural, with most of the damages the result of summer flooding of the croplands, discharges based on the "summer events" frequency were used to design the improved channels.

33. The "annual events" discharge-frequency curves for several locations in the Canaseraga Basin are shown on plate C12. Several methods were used to determine the frequency curves for these locations. Beard's analytical method for the 50 years of record at the gage was used to determine the frequency curve near Dansville. In the absence of an extended period of stage

or discharge records on Keshequa Creek, a Beard-type statistical study of seven Western New York gaging-stations with characteristics similar to the Keshequa Creek Basin was used to determine discharge-frequency relationships for Keshequa Creek at Sonyea. This method was also used for the inflow-frequency curve for Shakers Crossing, but the resulting curve was adjusted to reflect the reduction in lag time of the sub-area contributions due to storage in the Canaseraga Valley. The adjustment would account for the curve not being a straight line. The frequency curve for the outflow from Shakers Crossing was determined by routing the inflow flood volumes for various events through the storage area upstream of Shakers Crossing. The resulting outflow curve shown on plate C12 compared reasonably well with a curve determined for six years of record through 1964 at Shakers Crossing and adjusted by a correlation using the Dansville record.

34. The "summer events" (May through October) discharge-frequency curve for Dansville was determined using Beard's Plotting Position Method for peak discharges at Dansville for the period of record. To determine the "summer events" frequency curves for other desired areas in the Canaseraga Basin, a relationship based on drainage area was determined. Using a comparison of the total flows at Dansville and Shakers Crossing for three years of record, the relationship, $Q_{sc}/Q_d=(D.A._{sc}/D.A._d)^{0.77}$ where Q_{sc} is the discharge at Shakers Crossing, Q_d is the discharge at Dansville, $D.A._{sc}$ is the drainage area in sq. mi. at Shakers Crossing and $D.A._d$ is the drainage area in sq. mi. at Dansville, was determined. It was assumed that the above equation was applicable to other sub-areas of Canaseraga Creek and its tributaries at locations where frequency curves were desired and therefore frequency curves for these sub-areas were determined using this equation. The curves for several locations in the Canaseraga Basin are shown on plates C13 and C14.

35. STAGE-AREA INUNDATED CURVES FOR CANASERAGA VALLEY

Stage-area curves for the damage reaches shown on plate C15 were required to evaluate the agricultural benefits attributable to the proposed improvement. The stage-area curves for the damage reaches are shown on plate C16. Individual curves for existing and improved conditions in the ponding area reaches 2, 3 and 4 were required since under existing conditions the water surface in the ponding area is sloped while for improved conditions the water surface would nearly be horizontal due to the increased efficiency of the improved channels.

36. Flood profiles for several floods in the lower valley where ponding occurs provided the basic information from which the stage-area curves under existing conditions for reaches 1 through 4 and 6 were determined. For a given stage at the location of the proposed retention structure (Station 223+00 on Canaseraga Creek), the corresponding stages at other locations in the ponding area were plotted on cross sections at the various locations. The width of valley flooded at the various cross sections for the given stage at the retention structure were then determined from the cross sections. Multiplying the average width flooded between two adjacent cross sections by the distance between the cross sections determined the area flooded between the cross sections for the given stage at the retention structure. Addition of the flooded area between cross sections for all the sections in the ponding area produced the total flooded area for a given stage at the retention structure. Repetition of this process for several stages at the retention structure provided sufficient data to determine the stage-area relationship for reaches 1 through 4 and 6.

37. The stage-area relationships for improved conditions for reaches 2, 3, 4, and 6 (the reaches in the retention reservoir) were determined by the same method as explained above. However, because of the assumed level pool for improved conditions, the stage at any cross section would be the same as the stage at the retention structure, thereby simplifying the calculations considerably.

38. Referring to plate C15, "Damage Reaches," reaches 5, 7, and 8 are flooded by overland flow. In order to obtain the stage-area curves for these reaches, backwater computations were made on Canaseraga Creek to obtain overbank discharges for several frequencies. Using an estimated velocity of flow in the overbank and the previously determined overbank discharge, the cross-sectional area of flow in the overbank was determined, or $A=Q/V$, where A is cross-sectional area in sq. ft., Q is the overbank discharge in cfs, and V is the estimated overbank velocity of flow in feet per second. The stage at any desired location in the overbank could then be determined by relating the required cross-sectional area of flow to the actual cross section at the same location. The stage for a given frequency was determined at a sufficient number of locations in the overbank reaches to draw water surface profiles for the reaches. After determining the overbank water surface profiles for several frequencies the stage-area curves could then be obtained by the same method used for the sloping water surface in the ponding area.

39. STAGE-FREQUENCY FOR CANASERAGA VALLEY

Stage-frequency curves for the index points of the damage reaches shown on plate C15 were determined on the "summer events" and "annual" basis for existing conditions and on the "summer events" basis for improved conditions. The stage-frequency curves for the damage reaches for the above conditions are shown on plate C17.

40. For the reaches in the ponding area (reaches 1 through 4 and 6), a routing procedure was required to obtain the stage-frequency curves because of the storage effects of the pond. Routing of the inflow hydrograph for a given event through the ponds produced the maximum stage for the same event at the proposed retention structure. Stages at the various index points for the same event were then obtained using the water surface profile previously discussed in the stage-area section. Hydrographs for several events were routed through the ponding area to enable drawing of the stage-frequency curves.

41. AREA INUNDATED-FREQUENCY CURVES FOR CANASERAGA VALLEY

The stage-area curve for each reach was used with the relevant stage-frequency curve to obtain the area-inundated-frequency relationship for that reach. The resulting area inundated-frequency curves to be used to determine the agricultural benefits are shown on plate C18.

42. VOLUME-FREQUENCY CURVES

Volume-frequency determinations for the inflow volumes to the ponding area upstream of Shakers Crossing were made for various durations to determine the critical duration for design of the proposed retention structure. Routing of the inflow volumes through the retention reservoir determined the critical duration for any event to be approximately two days. For durations in excess of two days, the capacity of the retention structure spillway and the channel downstream would be sufficient to discharge a greater volume than the inflow volumes. The inflow volume-frequency curves for the maximum runoff of 1, 3, 7, 15, 60 and 90 consecutive days are shown on plate C9.

43. The inflow volume-frequency curves shown on plate C9 were determined using the 43 years of record through 1960 for the Dansville gage. The highest mean discharge for the above mentioned number of consecutive days for each year for the period of record was provided by the Department of Interior, Geological Survey-Water Resources Division. A beard-type

statistical analysis was used to determine the frequency curve for any particular duration of flow at Dansville. This determination was done by electronic computer using a program prepared by the Buffalo District. The flow-duration-frequency curves for the ponding area were then determined from the results for the Dansville gage using the drainage area relationship, $Q_{sc}=Q\ (D.A._{sc}/D.A._{d})^{0.77}$, previously discussed in paragraph 34. These flow-durations were then converted to volume-durations to produce the desired inflow-volume-frequency curves for the ponding area.

44. A comparison was made of the volume for several frequencies as determined above with the volume resulting from application of rainfall, for the same frequencies, to the unit hydrograph at Shakers Crossing. The volumes compared reasonably well, although the volumes determined using rainfall applied to the unit hydrograph were slightly higher. The volume-frequency curves were adjusted to reflect the results determined from applying rainfall to the unit graph since this condition would be more conservative.

45. HYDRAULIC DESIGN-CHANNELS

The design discharge for the considered plan of improvement was selected to provide the highest degree of protection based on the following considerations:

(1) 5-year "summer events" peak discharge;

(2) Provision of an adequate degree of protection for the type of damages sustained in the flooded area;

(3) Maximum allowable non-damaging discharge into the Genesee River;

(4) Channels resulting from the selected design discharge that are large enough and efficient enough to drain the ponding area in a designated time period;

(5) Consideration of maximization of benefits from improvements. A discharge of 7,300 cfs was adopted as the design discharge for the considered channel improvement. It has a frequency of occurrence of 5 years on a "summer events" basis, and an exceedence interval of about 1.4 years on an "annual" basis. A channel design providing protection against the 10-year summer event was investigated. The study showed that the most favorable benefits over cost ratio occurred at a discharge of 7,300 cfs. The design discharge on Canaseraga Creek was reduced in the upstream direction because of the

reduction in drainage area. It was determined that the critical design stages on the tributaries would occur with high stages on the Canaseraga and relatively low flows on the tributaries rather than at low stages on Canaseraga with high flows on the tributaries. The design discharge for the various reaches of channel is listed in table C6.

TABLE C6 - Design discharges along Canaseraga Creek and its Tributaries (1)

	Improved Channel Stationing From	To	Discharge (cfs)
Canaseraga Creek	-10+00	139+00	7,300
Canaseraga Creek	139+00	374+00	5,800
Canaseraga Creek	374+00	800+00	5,000
Keshequa Creek	0+00K	40+00K	1,500
Bradner Creek	0+00B	38+00B	800
Bradner Creek	38+00B	69+00B	400
State Canal	0+00C	39+00C	400

(1) 5-year "summer event" discharge on Canaseraga Creek.

46. Genesee River discharges at the mouth of Canaseraga Creek are controlled by operation of the Mount Morris Dam. For the channel design in the study area, it was assumed that the flow from Mount Morris Dam could be limited to 300 cfs, the required minimum when the inflow to the reservoir is in excess of this value. The design discharge of 7,300 cfs on Canaseraga Creek, in addition to the assumed 300 cfs from Mount Morris Dam, was backwatered up the Genesee River from Jones Bridge to the confluence of Canaseraga Creek to determine the tailwater elevation at the confluence.

47. Channel dimensions and grades to produce non-damaging stages at the design discharge were established by backwater computations made in accordance with instructions contained in EM 1110-2-1409 dated 7 December 1959, entitled, "Engineering and Design-Backwater Curves in River Channels." The backwater computations were made by "Method 1" in Appendix III of the above reference. Losses through bridges were computed by the formula $Q=KA\ (2gh+V)^{0.5}$ where K=contraction coefficient and varied depending on the relative constriction, A=net area of the bridge based on the downstream water surface elevation, h=differential head from upstream to downstream and V=the average velocity of approach. Where the plan would require new bridges, waterway openings were provided which would give the same flow area as the adjacent upstream channel at design flow conditions.

48. The improved channel sections were designed with a trapezoidal cross-section having sideslopes of 1 vertical on 2-1/2 horizontal. The improved channel would have vegetal protected side slopes except in reaches where high velocities would require riprap protection.

49. Water surface profiles for improved conditions were determined by the step solution of Manning's formula beginning at the U.S. Geological Survey gage at Jones bridge on the Genesee River where the water surface was known, and computing the water surface elevation at the next adjacent cross-section. This step solution was carried on through the entire reach of the project in the same manner as described above until the entire water surface profile was established for the design discharge for improved conditions. Water surface profiles for the design discharges for improved conditions are shown on plates C3 through C8. A Manning's "n" value of 0.030 was used for the improved, grass protected channels. Transition losses were taken as 0.2 and 0.4 of the difference in velocity heads between successive cross-sections for contractions and expansions, respectively. The average velocity throughout the improved reaches was kept below the maximum of 4.5 feet per second determined allowable for the type of soil in the study

area. The U.S. Department of Agriculture, Soil Conservation Service publication titled "Handbook of Channel Design for Soil and Water Conservation," dated March 1947, revised June 1954, was used to determine the type of vegetal cover to be used and channel velocities allowed for the given soil conditions.

50. Protection for the design discharge would require construction of a levee at the upstream limits of the study area. The levee would provide two feet of freeboard above the 10-year water surface profile and would range from 1 to 3 feet in height, including freeboard allowances. Except where riprap protection is proposed, seeding would be required on top of the levee and on both slopes.

51. HYDRAULIC DESIGN - RETENTION STRUCTURE

The retention structure would consist of an earth embankment with a spillway section and a protected overflow section. Details for the retention structure are shown on plate C9. The spillway section would consist of a low concrete sill with a vertical upstream face. The downstream face would be defined by the equation $X^2=40Y$, the considered optimum shape determined by model study for the low-head navigation dams on the Arkansas River and presented in Technical Report No. 2-655, September 1964 by the U.S. Army Engineer Waterways Experiment Station. The spillway section would consist of two 37.5-foot bays with one 10-foot wide center pier. Flow would be controlled by two tainter gates, each 37.5 feet long and 23.5 feet high. The spillway crest would be at elevation 549.0 with the top of the gates at elevation 572.5. A pool elevation of 555.0 would be maintained by locating the upstream invert of the outlet works at elevation 555.0 so that the water table upstream of the structure would be comparable to that under existing conditions. A spillway rating curve was computed for a net crest length of 75 feet. The basic discharge equation for submerged uncontrolled flow presented in T.R. 2-655, $Q=C_sLH\ (2g\ H_d)^{0.5}$ where, Q is the discharge in cfs, C_s is the discharge coefficient, L is the net length of spillway crest in feet, H is the tailwater elevation referred to weir crest in feet and H_d is the differential between total energy of the approach channel and depth of tailwater referred to the crest in feet, was used to determine the spillway rating curve. The discharge coefficient, C_s, was taken from plate 41 of T.R. 2-655.

52. The standard project flood (S.P.F.) was used as the basis of design for the protected overflow section. For the S.P.F., the crest velocity was limited to 8 feet per second. To adhere to the velocity requirements and the maximum allowable topography

requirements for the area, a length of overflow section of 3,500 feet would be required. The crest elevation would be 572.5 and the crest would have riprap protection. The maximum head on the crest would be 3.3 feet, the head differential between upper pool and tailwater would be 2.8 feet at maximum discharge and the maximum discharge over the overflow section would be about 59,000 cfs. The slope of the downstream face of the overflow section would be 1 vertical on 2-1/2 horizontal and would be riprapped from the crest to the toe of slope. The thickness of riprap would be 3 feet and 2 feet of filter blanket would be provided. Velocities on the downstream slope would vary from 12 fps at minimum tailwater conditions and an overflow section discharge of 17,000 cfs to approximately 20 fps at the maximum discharge would provide for dissipation of the velocity head at approximately a third of the distance down the downstream slope. Therefore it was considered that riprap protection would not be required for any appreciable distance downstream of the toe of slope.

53. The stilling basin for the gated section was designed in accordance with hydraulic design criteria established in the Bureau of Reclamation Engineering Monograph No. 25 entitled "Hydraulic Design of Stilling Basins and Energy Dissipators," dated 1964. The maximum spillway design flood pool elevation, with the corresponding maximum discharge, was used to determine the D_1 and D_2 depths. The stilling basin would be 85 feet wide and 100 feet long with its surface at elevation 547.6. Due to the submergence effect caused by high tailwater conditions, it was determined that an end sill would not be required.

54. The outlet works was designed to discharge 1000 cfs at an upper pool elevation of 564.0. This elevation would be 2 feet below the damaging stage in the area upstream of the retention structure. This criteria would provide for a minimum of operation of the spillway tainter gates during the summer months so as to prevent flooding of the croplands upstream of the retention structure. A duration study of daily summer flows at Dansville for 29 years of record, adjusted to Shakers Crossing, indicated that a flow of 1000 cfs on a daily basis could be expected to be exceeded about 1/2 of 1 percent of the time or about 1 day a year on the summer basis. The upstream invert elevation of the outlet works would be 555.0, the elevation required to prevent drawdown of the watertable below that under existing conditions. Slide gates would be provided. Table C7 is a summary of the hydraulic design data for proposed retention structure and appurtenances.

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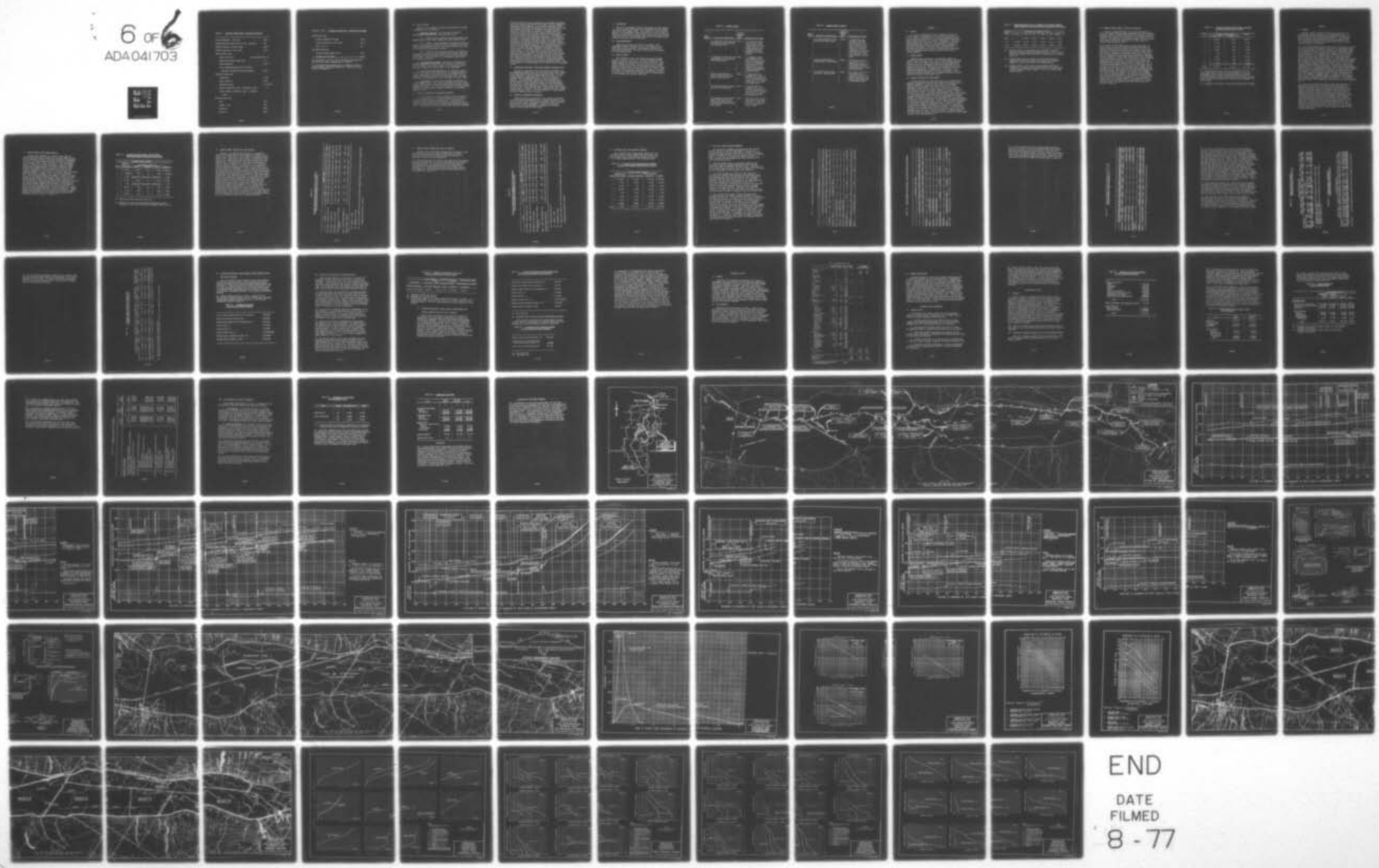

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MICROCOPY RESOLUTION TEST CHART
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TABLE C7. - Hydraulic design data - Retention Structure

Top of embankment - elevation	580
Maximum spillway design flood (S.P.F.) elevation	576
Channel elevation at heel of dam	546.9
Channel elevation at toe of dam	547.6
Gated spillway data	
Type of gate sill	Broad-crested weir (1)
Effective spillway length-feet	75
Crest elevation	549.0
Top of gates-elevation (elev. at which flow over the overflow section begins)	572.5
Overflow section data	
Length-feet	3,500
Crest elevation	572.5
Downstream slope	IV:2-1/2H
Riprap, downstream slope - thickness in feet	3
Filter blanket, downstream slope - thickness in feet	2
Stilling basin data	
Type	I(2)
Length - feet	100
Elevation	547.6
End sill	None

(TABLE C7. con't. - Hydraulic design data - Retention Structure)

Outlet works data	
Invert elevation at intake	555.0
Invert elevation at toe of dam	547.6
Area - sq. ft.	68
Tailwater Elevations	
Spillway design flood (S.P.F.)	573.5
Average flow (270 CFS)	549

(1) See plate 3, T.R. No. 2-655, "Spillway for Typical Low-Head Navigation Dams, Arkansas River, Arkansas."

(2) See Engineering Monograph No. 25, "Hydraulic Design of Stilling Basins and Energy Dissipators," dated 1964 by the Bureau of Reclamation.

55. *DESIGN DETAILS*

Details for the various structures incorporated in the plan of improvement are as follows:

a. Retention Structure - The retention structure is approximately 12,600 feet in length and consist of:

(1). A gated concrete spillway and stilling basin, with separate gated outlet works, founded upon steel monotube piles.

(2). A 9000 ft. earth embankment non-overflow section, of 18 feet top width and 1 vertical on 2-1/2 horizontal side slopes, seeded and provided with a 12-ft. wide gravel roadway across the top for access and maintenance purposes.

(3). A 3500 ft. earth overflow section, of 18 feet top width and 1 vertical on 2-1/2 horizontal side slopes, seeded on the upstream slope, and riprapped across the top width and downstream slope. The riprap is a 3 ft. thickness of stone with a 2 ft. filter thickness.

b. Fish and Wildlife Ponds - The ponds are enclosed with an earth embankment, of ten feet top width, and 1 vertical on 2-1/2 horizontal side slopes, seeded. A small pumping station and gated conduits are incorporated into the embankment.

c. Control Structures and Weirs - The structures consist of Z-27 steel sheet piling driven across the channel bottom and into the side slopes. The upstream part is riprapped with an 18-inch thickness of stone upon a 6-inch filter bed. The downstream end is riprapped with a 2-ft. thickness of derrick stone.

d. New Bridge - The two highway bridges are designed for a H-20 highway loading. The 22-ft. wide bridge deck is of steel grating supported on a steel beam superstructure erected on steel monotube pile bents. The three farm bridges are of similar design except the roadway width is reduced to 12 feet and the design loading is H-15.

56. METHOD OF OPERATION OF RETENTION STRUCTURE

The operation of the proposed retention structure would be a Federal responsibility. It would be operated in conjunction with Mount Morris Dam on the Genesee River. Stages in the retention reservoir would be telemetered to Mount Morris Dam and the spillway tainter gates operated from Mount Morris accordingly. The permanent fish and wildlife ponds within the proposed

retention reservoir would be regulated by non-Federal interests. During the spring runoff period, the runoff from the Canaseraga Creek Basin would be stored in the retention reservoir while discharging the maximum non-damaging flows from Mount Morris Dam. This method would result in providing the maximum available storage in the Mount Morris reservoir to provide control of future high runoff from the Upper Genesee Basin while using the stored volume in the retention reservoir on Canaseraga Creek to fill the Fish and Wildlife ponds upstream of the retention structure. In the event additional high flows to the retention reservoir on Canaseraga Creek would present the possibility of overtopping the 3500 foot overflow section and thereby losing control of the discharge from the retention reservoir, flow from Mount Morris Dam would be reduced to the required minimum of 300 cfs in order that high non-damaging discharges could be released from the retention reservoir utilizing the spillway tainter gates. If the local flows in the Lower Genesee River Basin were high at this time, the discharge from the retention reservoir would be limited to the flow that would have occurred under natural conditions. During summer storms, the outflow from Mount Morris Dam would be limited to the required minimum for a sufficient period of time to permit maximum non-damaging discharge from the retention structure on Canaseraga Creek. This would provide for minimum damage to the croplands in the Canaseraga Valley.

57. FOUNDATION CONDITIONS AT PROPOSED RETENTION STRUCTURE SITE

The site is downstream of the confluence of Keshequa Creek with Canaseraga Creek on the floor of a practically level valley, the average width of which is approximately 2 miles. Two relatively shallow borings were made in the valley close to the proposed damsite, penetrating about 32 feet of foundation material. The approximate location of the explorations are shown on plate C2 and the plotted logs of the borings appear on plate C9. The soils within this depth are very fine-grained and impervious, consisting mainly of medium or firm lean clays and silty clays. It is reported that a well-boring, drilled about 3 miles north of Dansville, New York, penetrated 450 feet without reaching bedrock. Hence, it will be necessary to found concrete structures (spillway, etc.) on piles.

58. SOURCES OF CONSTRUCTION MATERIALS

Impervious soils are available in the valley for construction of the rolled embankments of the retention structure, wildlife ponds and levees. The material excavated from the channels would be used for the embankments. Stone for riprap and materials for concrete aggregate and bedding are available within a 20-mile radius of the project.

59. RELOCATIONS

The plan of improvement requires replacement of farm bridges 1, 4 and 6, Everman Road bridge over Canaseraga Creek and Pioneer Road bridge over Bradner Creek. Farm bridges 2, 3 and 5 would be removed. The locations of these structures are shown on plate C2. Underground communication cables, water lines or gas lines located within the limits of the permanent wildlife ponds upstream of the retention structure would be relocated.

60. LAND REQUIREMENTS

Lands for the retention structure embankment, levee embankment, channel improvement and the two permanent wildlife ponds would be required. Approximately 1400 acres of land would be required, 1140 acres of which would be required for the wildlife ponds.

61. DAMAGE REACHES.

The locations of index points and the limits of damage reaches are shown on plate C15. Brief descriptions of the damage reaches and index points are given in table C8. Eight damage reaches were selected so that the area in each reach would be subject to flooding from the same source to approximately the same stage, so that the effects of higher or lower discharges would be uniform throughout the reach. The limits were also set, considering anticipated improvements, so that the index points within these reaches would be representative of both existing and improved conditions.

TABLE C8. - Damage reaches

Reach Number	Location of Index Point	Initial Damaging Stage Feet	Description of reach
1	On Canaseraga Creek 1600 feet downstream of the confluence with Keshequa Creek	560.0	An irregular shaped area with the downstream limit at State Route 408 and the upstream limit at the proposed retention structure at station 223+00.
2	On Canaseraga Creek 1400 feet downstream of the confluence with Keshequa Creek	560.0	A triangular shaped area bounded on the west by the Erie-Lackawana R.R. embankment, on the east by State Route 63 and on the south by the proposed retention structure at station 223+00.
3	100 feet downstream of Pioneer Road and 1500 feet east of State Route 36	568.0	A trapezoidal area bounded on the east by the Erie-Lackawanna R.R., on the north by Keshequa Creek and on the south by Pioneer Road.
4	100 feet downstream of State Route 258 on State Canal	566.0	A trapezoidal area bounded on the east by the Erie-Lackawanna R.R., on the north by Pioneer Road and on the south by State Route 258.
5	On Canaseraga Creek approximately 3500 feet north of Everman Road bridge and 50 feet upstream of an existing farm bridge	583.8	The area to the east of the Dansville and Mount Morris R.R. from State Route 258 upstream to White bridge.

TABLE C8. - Damage reaches (cont'd

Reach Number	Location of Index Point	Initial Damaging Stage Feet	Description of reach
6	100 feet upstream of State Route 258 on State Canal	566.0	A trapezoidal area bounded on the east by the D.&M Mo.R.R., on the north by State Route 258 and on the south by a line perpendicular to the railroad 9100 feet south of the junction of State Route 258 and the railroad.
7	7200 feet downstream of Everman Road on State Canal	568.0	The area to the west of the D.&M.Mo. R.R., bounded on the north by the southern limit of reach 6 and on the south by Everman Road.
8	On Bradner Creek 100 feet upstream of Everman Road	582.8	The area to the west of the D.&M.Mo.R.R., bounded on the north by Everman Road and on the south by the right bank of Canaseraga Creek.

DAMAGES

62. GENERAL

The study to determine the flood damages and the flood control benefits attributable to the proposed improvement was a joint endeavor undertaken by the Corps of Engineers and the Soil Conservation Service of the U.S. Department of Agriculture. Damage surveys were made by the Corps of Engineers. The area inundated-frequency curves that were required to obtain the average annual flood damages and benefits were determined by the Corps of Engineers. Combining this information with additional data collected, the Soil Conservation Service determined the damages under existing conditions and the flood control benefits.

63. DAMAGE SURVEY

Damage surveys were made in the Canaseraga Valley in November 1961 and January 1962 to obtain flood damages resulting from the April 1961 flood. Personnel of the Soil Conservation Service of the U.S. Department of Agriculture assisted in the surveys since they were familiar with the problem area and the landowners in the area. Interviews were conducted with 18 landowners and provided data on approximately 45 percent of the cropland acreage flooded during the April 1961 flood. Local officials provided information as to damages sustained to public facilities during the April 1961 flood.

64. METHOD OF ESTIMATING FLOOD DAMAGE

The data collected for the April 1961 flood, combined with additional information obtained from members of the agricultural business community, served as a basis for the flood damage analysis made by the Soil Conservation Service of the U.S. Department of Agriculture. As a first step, per acre damages were computed for crop and pasture losses for three agricultural reaches of the valley. The three reaches chosen were: Reach 1 - the ponding area from State Route 408 upstream to Pioneer Road; Reach 2 - the ponding area from Pioneer Road to approximately 8000 feet upstream of Groveland; Reach 3 - the area susceptable to overland flooding from 8000 feet upstream of Groveland to the upstream limits of the study area at White Road. This procedure involves computations of potentially damageable values by crop. The values are weighted by the percent chance of occurrence by month, land use, depth of flooding, and probability of recurrence in order to determine the average per acre damage resulting from flooding. To these values are added other on-farm losses such as damage to fences, farm roads, equipment and other items. Table C9 lists the estimated average per acre damage for selected frequencies for the three original damage reaches of the Canaseraga Valley.

TABLE C9. - Estimated average per acre damage for the three original damage reaches on long term adjusted normalized price levels.

Original reach	Frequency of events in years 1	2	5	10	20	100
	$	$	$	$	$	$
1 (1)	-	11.00	13.54	13.28	13.33	13.61
2 (2)	11.08	11.48	11.76	11.73	11.71	11.84
3 (3)	18.50	18.76	18.82	18.83	18.88	18.93

(1). Original reach 1 is the ponding area from State Route 408 upstream to Pioneer Road and includes reaches 1, 2 and 3 of the final eight damage reaches described in paragraph 61 and shown on plate C15.

(2). Original reach 2 is the ponding area from Pioneer Road to approximately 8000 feet upstream of Groveland and includes reaches 4, 5 and 6 of the final eight damage reaches.

(3). Original reach 3 is the area from approximately 8000 feet upstream of Groveland to the upstream limits of the study area at White Road and includes reaches 7 and 8 of the final eight damage reaches.

65. AVERAGE ANNUAL DAMAGES, EXISTING CONDITIONS

Initially, damage-frequency curves were determined for the three original reaches using the appropriate area inundated-frequency curves for these three reaches in conjunction with the corresponding values of the estimated per acre damage listed in table C9. The estimated average annual damage for each of these three damage reaches was determined as the area under the related damage-frequency curve.

66. In order that the index point of a given reach would be representative of both existing and improved conditions, the number of reaches and reach limits were revised. The three agricultural reaches were broken into the eight damage reaches discussed in paragraph 61 and shown on plate C15. Due to the scope of this report and the limited time available, average per acre damages for these eight reaches were not re-evaluated and were assumed to be the values determined for the corresponding original damage reaches. As an alternative method, the damage-frequency results for the three original reaches were apportioned to the eight damage reaches by land area. The resulting damage-frequency curves for the eight damage reaches are shown on plate C19. The area under each of these curves represents the estimated direct average annual damages for the considered reach. The total direct average annual damages for the eight reaches was comparable to the total as determined for the three original reaches. The indirect flood damages, e.g., those losses sustained by the industries processing and using the products that would be damaged, etc., were estimated at 10 percent of the direct damages. The estimated direct, indirect and total average annual flood damages for the eight reaches at long term adjusted normalized price levels are listed in table C10.

TABLE C10. - Estimated average annual damage, long term adjusted normalized price levels.

Reach	Average annual damage Direct (1)	Indirect (2)	Totals
1	$ 15,850	$ 1,590	$ 17,440
2	14,010	1,400	15,410
3	1,390	140	1,530
4	10,360	1,040	11,400
5	290	30	320
6	9,250	920	10,170
7	4,330	430	4,760
8	9,170	920	10,090
Total	$ 64,650	$ 6,470	$ 71,120

(1) Values listed in Table C10 were determined by the Soil Conservation Service and do not conform exactly to the Corps of Engineer's values shown on plate C19 which total $66,040. Table C10 values were used as the basis for the economic analysis of the project and supercede those values listed in Appendix "F," Flood Control.

(2) Estimated at 10 percent of the direct average annual damages.

BENEFITS

67. GENERAL

Benefits would be realized from several sources for the multi-purpose project proposed for the Canaseraga Valley. The estimated flood control benefits attributable to the project were provided by the Soil Conservation Service. The estimated fish and wildlife recreational benefits were provided by the U.S. Department of Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife.

68. Flood control benefits would result from the reduction of flood damages to agricultural lands by the lowering of Canaseraga Creek and tributary stages in the lower reaches of the Canaseraga Valley and protection by a levee in the upper reaches. Additional flood control benefits would be derived from changed land use and more intensive land use. The changed land use benefits would result from growing high value crops on land that is presently being used to grow lower valued crops because of the existing flood problem. The changed land use benefits are based upon the difference between the net annual incomes derived from present crops and that derived from crops which farmers indicate they would grow if assured that flooding would be limited in frequency. Where land is potentially productive, as in the Canaseraga Valley, these benefits are substantial. Closely allied to changed land use benefits are more intensive land use benefits. These benefits are derived from shifting the land to a more intensified cropping system within the same general use plan. For example, additional inputs of capital in the form of fertilizers or land treatment might be justified on the unflooded land, causing increases in yield and profitability. The benefits are again equal to the increased net income due to the more intensive use.

69. Fish and wildlife benefits would result from provision of ponding areas to be used as resting and feeding areas for migratory waterfowl during the spring and fall migration and as nesting and rearing areas for continental waterfowl during the summer. Additional benefits that would be realized from the improvement are the recreational benefits from increased bird-watching opportunity and increased waterfoul hunting opportunity. An analysis of the increase in hunter demand in the Genesee Basin indicates that the number of hunter-days for all types of hunting can be expected to increase more than threefold by the year 1990. Provided with the proposed permanent ponds, the number of waterfowl hunter-days attributable to the project can be expected to increase at least at the same rate. The project could be expected to provide at least the same increase in bird-watching opportunity.

70. AVERAGE ANNUAL FLOOD DAMAGE BENEFITS

Average annual damages to be expected under improved channel conditions were developed for the eight damage reaches of the Canaseraga Valley by the method described in paragraphs 65 and 66. The area inundated-frequency curves as determined on the "summer events" basis were used to obtain the damage-frequency curves for improved conditions. Using the "summer events" area-frequency curves for improved conditions shown on plate C18 produces benefits slightly in excess of those actually attributable to the project because the area that would be flooded to a higher stage on an annual basis and produce additional damage to nursery stock, farm roads, equipment, etc., would not be included in the damages. However, the major portion of the damages sustained would occur during the summer growing season, so use of the "summer events" curves would provide realistic values for the damages under improved conditions. The "summer events" damage-frequency curves as determined for improved conditions utilizing the appropriate area-frequency curves and per acre damage values are shown on plate C19. The area under these damage-frequency curves represents the residual direct average annual damage under improved conditions. Indirect damages were estimated to be 10 percent of the direct damages. Estimated flood benefits for the eight damage reaches of the Canaseraga Valley are given in table C11.

TABLE C11. - **Estimated average annual flood benefits, long term adjusted normalized price levels.**

	Average annual damages				
	With no flood (1)	With flood protection			
Reach	protection	Direct	Indirect	Total	Benefits
1	$ 17,440	$ 1,200	$ 120	$ 1,320	$ 16,120
2	3,690(2)	290	30	320	3,370(2)
3	1,530	negligible	negligible	negligible	1,530
4	11.400	1,110	110	1,220	10,180
5	320	negligible	negligible	negligible	320
6	10,170	500	50	550	9,620
7	4,760	300	30	330	4,430
8	10.090	700	70	770	9,320

(1) Values given were taken from table C10.

(2) Benefits for reach 2 were determined excluding the areas designated for the Fish and Wildlife Permanent Ponds I and II.

71. AVERAGE ANNUAL CHANGED LAND USE BENEFITS

Because of the existing flood problem, a substantial portion of the Canaseraga Valley farmland is presently used to grow a lower valued crop on lands capable of supporting higher valued crops. Reduction in the frequency of flooding and the duration of flooding would make this land available for higher valued crops. Landowners were interviewed to determine the type of crop they would grow on this land if the frequency of flooding would be reduced. An estimate of the acreage that would be converted to growing the higher valued crops was also obtained during the interviews. The net income to be expected for changed land use was then determined by relating the acreage involved to the per acre value of the type of crop to be grown. This procedure was also used to determine the net income under present use. The difference between the net income for changed land use and present use, discounted to reflect the time required for buildup upon completion of the improvement and further reduced to account for the added damage that would result from flooding of the changed land involved, would produce the average annual benefits for the changed land use. The buildup period was estimated to be ten years and the increase in average annual flood damage chargeable to the changed land use was estimated at ten percent of the difference in net income. Table C12 is a tabulation of the values used to obtain the changed land use benefits and the resulting benefits for the eight damage reaches of the Canaseraga Valley.

TABLE C12.

Estimated average annual change land use benefits, long term adjusted normalized price levels.

Item	Damage reach 1	2(3)	3	4	5	6	7	8	Total
	$	$	$	$	$	$	$	$	$
Net income - Changed land use	62,520	49,070	9,970	37,920	28,030	44,580	76,630	404,480	713,200
Net income - Present use	57,130	44,300	9,110	32,940	26,290	38,740	71,140	395,420	675,070
Difference in Net income	5,390	4,770	860	4,980	1,740	5,840	5,490	9,060	38,130
Discounted for 10 year buildup at 6% (1)	5,280	4,680	840	4,880	1,710	5,730	5,380	8,880	37,380
Less: Added flood damage (2)	530	470	80	490	170	570	540	890	3,740
Average annual benefits	4,750	4,210	760	4,390	1,540	5,160	4,840	7,990	33,640

(1) Factor = 0.98

(2) Assumed to be 10%

(3) Areas to be used for the Fish and Wildlife Permanent Ponds I and II were not included when determining the reach 2 benefits.

72. AVERAGE ANNUAL INTENSIFIED LAND USE BENEFITS

The lands that would produce changed land use benefits could also provide increases in yield and profitability through the use of more intensive production practices resulting in additional benefits from the improvement.

73. The procedure used to determine the changed land use benefits discussed in paragraph 71 was used to determine the intensified land use benefits. The net income from the changed land use was subtracted from the intensified land use to obtain the difference in net income from which the average annual benefits were determined. The resulting intensified land use benefits are presented in table C13.

TABLE C13.

Estimated average annual intensive land use benefits, long term adjusted normalized price levels.

Item	Damage Reach 1	2(4)	3	4	5	6	7	8	Total
	$	$	$	$	$	$	$	$	$
Net income - More intensive use	91.090	70,870	14,530	54,030	31,800	63,530	86,730	421,150	833,730
Net income - Changed land use (1)	62,520	49,070	9,970	37,920	28,030	44,580	76,630	404,480	713,200
Difference in net income	28,570	21,800	4,560	16,110	3,770	18,950	10,100	16,670	120,530
Discounted for 10 year buildup at 6% (2)	28,010	21,370	4,470	15,790	3,700	18,580	9,900	16,340	118,160
Less: Added flood damage (3)	2,800	2,140	450	1,580	370	1,860	990	1,630	11,820
Average annual benefits	25,210	19,230	4,020	14,210	3,330	16,720	8,910	14,710	106,340

(1) Values from table C12

(2) Factor = 0.98

(3) Assumed to be 10%

(4) Areas to be used for the Fish and Wildlife Permanent Ponds I and II were not included when determining the Reach 2 benefits.

74. ESTIMATED TOTAL FLOOD CONTROL BENEFITS

The estimated total average annual benefits for the reduction of flood losses, changed land use benefits and more intensive land use benefits are shown in table C14 for the eight damage reaches of the Canaseraga Valley.

TABLE C14. - Estimated total average annual benefits at long term adjusted normalized price levels.

Reach	Average annual benefits: Reduction of flood losses	Changed land use	More intensive land use	Totals
1	$ 16,120	$ 4,750	$ 25,210	$ 46,080
2	3,370	4,210	19,230	26,810
3	1,530	760	4,020	6,310
4	10,180	4,390	14,210	28,780
5	320	1,540	3,330	5,190
6	9,620	5,160	16,720	31,500
7	4,430	4,840	8,910	18,180
8	9,320	7,990	14,710	32,020
Totals:	$ 54,890	$ 33,640	$ 106,340	$194,870

75. FISH AND WILDLIFE HABITAT BENEFITS

The information presented was provided by the Fish and Wildlife Service of the U.S. Department of Interior in a Planning Aid Letter dated 15 June 1967 to be used for project planning purposes only and not to be used in lieu of an approved report. A portion of the discussion presented herein is taken verbatim from the Planning Aid Letter provided by the Fish and Wildlife Service.

76. Moderate fishery values in the lower reaches of the Canaseraga Valley are greatly outweighed by the waterfowl values that would be realized from the project. Therefore, it was considered that the latter should be conserved and developed even at the expense of some losses to the fisheries.

77. The poorly drained area from near State Route 408 upstream to Groveland, known locally as the Groveland Flats, has throughout the years provided habitat where thousands of migrating waterfowl have found a place to rest and feed. Primarily, this has been a stopping point on spring migration, due to the presence of ponding waters at that time. A relatively small amount of nesting has occurred; this has been limited, as has fall migration use, by the lack of ponded waters in the summer and fall. Assuming that conditions continue to be about what they have been in the past, future use of the area is likely to remain at about the present level.

78. The average daily numbers of ducks and geese which presently use the area during different periods of the year are shown in table C15. In order to be able to draw comparisons with conditions which would exist with the project, this use has been related, insofar as possible, to the contemplated future pools. Since there is no ponded water at present, except in the spring, use during the nesting and rearing season and during fall migration could only be shown under the heading "Groveland Flats, General." The number of young produced means, in this case, the number reared to flight stage. Under present conditions and, it is assumed, in the future without the project, this number is considered to be five birds per breeding pair. Table C16, which shows the number of waterfowl-use days projected without the project, is developed directly from the data in table C15.

TABLE C15. - Average daily numbers of waterfowl without the project

		Waterfowl Populations									
		Spring Influx		Breeding Birds		Young Produced		Late Summer Use		Fall Influx	
		Ducks	Geese	Ducks	Geese	Ducks	Geese	Ducks	Geese	Ducks	Geese
No. of Days		30	40	79	None	40	None	30	None	60	60
Location	Acres				Numbers of Birds						
Pool I	740	2,400	3,000								
Pool II	400	1,300	2,000								
Pool III	2,000	6,300	10,000								
Goveland Flats				200	-	500	-	200	-	500	250
(General)											
Totals		10,000	15,000	200		500		200		500	250

Table C16. - Annual number of waterfowl - use days without the project

	Waterfowl - Use Days									
	Spring Influx		Breeding Birds		Young Produced		Late Summer Use		Fall Influx	
Location	Ducks	Geese	Ducks	Geese	Ducks	Geese	Ducks	Geese	Ducks	Geese
Pool I	72,000	120,000								
Pool II	39,000	80,000								
Pool III	189,000	400,000								
Groveland Flats			15,800	-	20,000	-	6,000	-	30,000	15,000
(General)										
Totals	300,000	600,000	15,800	-	20,000		6,000		30,000	15,000

Grand Total 986,800 waterfowl - use days (1 waterfowl - use day = 1 bird for 1 day)

79. Values for habitat such as the above cannot be measured directly in dollars. Using the least-cost alternative justifiable expenditure method, a minimum value of 12.4 cents per waterfowl-use day was developed. Table C17 presents the annual dollar value for habitat without the project. The dollar values listed were determined by application of the minimum value per waterfowl-use day to the number of use-days shown in table C16.

Table C17. - Annual without the project waterfowl use days and estimated habitat value in dollars (1)

Location	Spring Migration: Waterfowl Days	Spring Migration: Dollar Value $	Nesting & Rearing: Waterfowl Days	Nesting & Rearing: Dollar Value $	Later Summer Use: Waterfowl Days	Later Summer Use: Dollar Value $	Fall Migration: Waterfowl Days	Fall Migration: Dollar Value $	Total Use & Value: Waterfowl Days	Total Use & Value: Dollar Value $
Pool I	192,000	23,800							192,000	23,800
Pool II	119,000	14,800							119,000	14,800
Pool III	589,000	73,000							589,000	73,000
Groveland Flats										
General	-		35,800	4,400	6,000	700	45,000	5,600	86,800	10,700
Totals	900,000	111,600	35,800	4,400	6,000	700	45,000	5,600	986,800	122,300

(1) Dollar value based on the minimum value of $0.124 per waterfowl use day.

80. The plan of improvement for the local flood protection project in the Canaseraga Valley would provide for alleviating the flood problems for the agricultural interests and at the same time improve conditions for wildlife, particularly waterfowl. Under existing conditions the ponding areas that form in the lower reaches of the valley in the spring provide a resting and feeding area for migratory waterfowl. However, lack of ponded waters during the summer and fall preclude the use of this area as a major nesting and rearing area during the summer or as a resting and feeding area for waterfowl during the fall migration. Provision of the three ponding areas shown on plate C10 would greatly enhance the area for the above summer and fall purposes and provide a larger and more reliable area to be used by the waterfowl during the spring migration. Permanent Ponds I and II would provide areas to be used during the summer and fall. The Temporary Pond III would be maintained until some mutually agreed upon date in the spring by the agricultural and wildlife interests. This pond would be of considerable area and would provide for a resting and feeding area during the spring migration.

81. The information presented for conditions with the proposed improvement was determined assuming that the Temporary Pond III would not be drained until 15 May each year, at which time most of the birds will have departed from the area and the few remaining could move over to one of the permanent ponds. If Temporary Pond III were to be drained by 15 April, it was estimated that the ultimate waterfowl habitat value indicated would be cut in half.

82. Table C18 shows the ultimate average daily number of waterfowl with the project. The ultimate is expected to be realized about 20 years after completion of the project. Table C19 is a tabulation of the number of waterfowl-use days annually for ultimate conditions. It is anticipated that about 58, 85 and 96 percent of the ultimate use values will have developed within 5, 10 and 15 years, respectively, after completion of the project.

TABLE C18. - With the project, ultimate average daily number of waterfowl

Waterfowl Populations

Location	Acres	Spring Influx: Ducks	Spring Influx: Geese	Breeding Birds: Ducks	Breeding Birds: Geese	Young Produced: Ducks	Young Produced: Geese	Late Summer Use: Ducks	Late Summer Use: Geese	Fall Influx: Ducks	Fall Influx: Geese
No. of Days		30	40	79	79	40	40	30	30	60	60
		Number of Birds									
Pool I	740	3,500	5,200	500	130	1,000 1/	230 2/	300	120	7,000	4,000
Pool II	400	2,000	3,000	250	70	500 1/	120 2/	150	60	6,000	2,000
Pool III	2,000	9,500	14,200	300	30	600 1/	50 2/	-	30	1,000	500
Totals		15,000	22,400	1,050	230	2,100	400	450	210	14,000	6,500

1/ Assumed average 4 ducklings per breeding pair reared to flight stage (rounded to nearest 100).

2/ Assumed average 3.5 goslings per breeding pair reared to flight stage (rounded to nearest 10).

TABLE C19. - Ultimate number of waterfowl-usedays annually with the project

Waterfowl-use days

Location	Spring Influx: Ducks	Spring Influx: Geese	Breeding Birds: Ducks	Breeding Birds: Geese	Young Produced: Ducks	Young Produced: Geese	Late Summer Use: Ducks	Late Summer Use: Geese	Fall Influx: Ducks	Fall Influx: Geese
Pool I	105,000	208,000	39,500	10,300	40,000	9,200	9,000	3,600	420,000	240,000
Pool II	60,000	120,000	19,800	5,500	20,000	4,800	4,500	1,800	360,000	120,000
Pool III	285,000	568,000	23,700	2,400	24,000	2,000	-	900	60,000	30,000
Totals	450,000	896,000	83,000	18,200	84,000	16,000	13,500	6,300	840,000	390,000

Grand Total 2,796,000 waterfowl-use days 20 years after completion of the project.

83. Table C20 presents the annual dollar value for habitat under ultimate conditions which would be realized about 20 years after completion of the project. The dollar values shown were determined by applying the minimum value of 12.4 cents per waterfowl-use day to the number of use-days.

TABLE C20. - Ultimate annual waterfowl use days and estimated habitat value in dollars (2)

Location	Spring Migration Waterfowl Days	Spring Migration Dollar Value 1/	Nesting & Rearing Waterfowl Days	Nesting & Rearing Dollar Value 1/	Late Summer Use Waterfowl Days	Late Summer Use Dollar Value 1/	Fall Migration Waterfowl Days	Fall Migration Dollar Value 1/	Total Use & Value Waterfowl Days	Total Use & Value Dollar Value
Pool I	313,000	$ 38,800	99,000	$12,300	12,600	$1,600	660,000	$ 81,800	1,084,600	$134,500
Pool II	180,000	22,300	50,100	6,200	6,300	800	480,000	59,500	716,400	88,800
Pool III	853,000	105,800	52,100	6,500	900	100	90,000	11,200	996,000	123,600
Totals	1,346,000	$166,900	201,200	$25,000	19,800	$2,500	1,230,000	$152,500	2,797,000	$346,900

1/ All dollar values rounded to nearest $100.
2 Ultimate use is expected to develop within 20 years after completion of the project.

84. ESTIMATED EQUIVALENT AVERAGE ANNUAL HABITAT BENEFITS OVER THE LIFE OF PROJECT

Due to the growth period required to obtain the ultimate dollar values with the project, a discounting procedure was required to determine the equivalent average annual benefits for the habitat. Plotting of the dollar values estimated for 5, 10, 15 and 20 years after completion of the project indicated that an assumed straight line growth rate for a period of 15 years would produce a reasonable estimate of the average annual habitat benefits.

85. Using a growth period of 15 years, a project life of 50 years and an annual interest rate of 3-1/8 percent, equivalent average annual waterfoul habitat benefits of $171,220 were determined as shown in table C21.

TABLE C21. - Estimated equivalent average annual habitat benefits

Total ultimate dollar value with the project	$346,900
Without the project dollar value	$122,300
Maximum annual amount to be discontinued = a	$224,600
Project life = n	50 years
Growth period = g	15 years
Annual interest rate = i	3-1/8 percent
Average annual equivalent factor = Ef	0.7623392
Average annual benefits = a(Ef)	$171,220

86. RELATED BIRD-WATCHING AND HUNTING BENEFITS

During spring migration, the presence of thousands of waterfowl attracts people from as far away as Buffalo and Rochester. A survey by the New York State Division of Fish and Game in 1964 determined that at least 15,000 bird-watching days were enjoyed because of the birds at Groveland Flats that year. It is considered that this probably will be about the level of this type of use in the future without the project.

87. Groveland Flats also provides for a considerable amount of waterfowl-hunting opportunity at present, both directly through hunting use of the area itself and indirectly because it has a considerable effect on holding birds in the general area although they move out to feed in fields and waters which may be quite a distance away. Direct use of the area for hunting is estimated at 1,000 days annually, while the additional use of areas within the field of influence due to the holding effect is estimated to be 1,500 hunter-days.

88. On the basis that the net value of a recreational day of bird-watching in the Groveland Flats area is $0.50 and that a day of waterfowl-hunting is $4.00, the respective annual values of these two forms of recreation without the project amount to $7,500 (15,000 bird-watching days x $0.50 per day) and $10,000 (2,500 hunter days x $4.00 per day).

89. As previously stated in paragraph 69, bird-watching and hunter-use days could be expected to at least triple if the proposed project were constructed. This would increase the bird-watching use days to 7,500 (2,500 x 3) annually with the project. It was estimated that a 20-year period after completion of the project would be required to attain this useage and about 56, 84 and 96 percent of the 20-year value would be realized in 5, 10 and 15 years, respectively, after completion of the project.

90. The related monetary values with the project for bird-watching and waterfowl hunting would be $22,500 (45,000 bird-watching days x $0.50 per day) and $30,000 (7,500 hunter-days x $4.00 per day), respectively. Table C22 summarize the annual values for these benefits with and without the project. The bird-watching and hunting values were combined in the table since it was estimated that the growth rates to obtain the ultimate values would be the same.

TABLE C22. - Summary of estimated annual bird-watching and waterfowl hunting values

Condition	Bird-watching: Use days	Bird-watching: Dollar(1) value	Waterfowl hunting: Use days	Waterfowl hunting: Dollar(2) value	Total dollar value birdwatching & hunting
With the project	45,000	$22,500	7,500	$30,000	$52,500(3)
Without the project	15,000	7,500	2,500	$10,000	$17,500

(1) Estimated at $0.50 per use day
(2) Estimated at $4.00 per use day
(3) Annual dollar value 20 years after completion of project = $52,500. It is expected that about 56,84 and 96 percent of the 20-year value will have developed within 5, 10 and 15 years respectively, after completion of the project.

91. ESTIMATED EQUIVALENT AVERAGE ANNUAL BIRD-WATCHING AND HUNTING BENEFITS OVER THE LIFE OF PROJECT

Again, due to the growth period required to attain the ultimate use with the project, discounting was required to determine the equivalent average annual benefits attributable to the above interests. As was the case in the determination of the average annual waterfowl habitat benefits, plotting of the dollar values estimated for 5, 10, 15 and 20 years after completion of the project indicated that a straight line growth rate for a period of 15 years would produce a reasonable estimate of the average annual bird-watching and hunting benefits. Therefore, using a growth period of 15-years, a project life of 50 years and an annual interest rate of 3-1/8%, equivalent average annual bird-watching and hunting benefits of $26,680 were determined as shown in table C23.

TABLE C23. - Estimated equivalent average annual bird-watching and waterfowl hunting benefits

Total dollar value with the project (1)	$52,500
Without the project dollar value (1)	$17,500
Maximum annual amount to be discounted = a	$35,000
Project life = n	50 years
Growth period = g	15 years
Annual interest rate = i	3-1/8 percent
Average annual equivalent factor = Ef	0.7623392
Average annual benefits = a(Ef)	$26,680

(1) From table C22

92. ESTIMATED TOTAL FISH AND WILDLIFE RECREATIONAL BENEFITS

The estimated total equivalent average annual fish and wildlife benefits attributable to waterfowl habitat and bird-watching and waterfowl hunting are shown in table C24.

TABLE C24. - Estimated total equivalent average annual fish and wildlife benefits

Average annual habitat benefits (1)	$171,220
Average annual bird-watching and waterfowl hunting benefits (2)	26,680
Total fish and wildlife benefits	$197,900

(1) From table C21.
(2) From table C23.

93. Comparison of the estimated total average annual flood control benefits of $194,870 shown in table C14 with the estimated total average annual fish and wildlife recreational benefits of $197,900 shown in table C24 shows that slightly more than 50 percent of the total project benefits would be provided by the fish and wildlife interests. Normally, a project could not be recommended if the general recreational benefits provide for 1/2 of the total project benefits. However, a large portion of the total fish and wildlife benefits would result from enhancement to migratory waterfowl. On the basis that the preservation and enhancement of migratory waterfowl would be of national significance, it was considered that this portion of the fish and wildlife benefits would not be classified as general recreational benefits and therefore should not be included when comparing the estimated total average annual fish and wildlife benefits to the total project benefits. Using this criterion, it was determined that the remaining general recreational benefits would provide for considerably less than 50 percent of the total fish and wildlife benefits over flood control benefits would only be $3,030 ($197,900-$194,870) it was considered that it would not be necessary to separate the benefits attributable to the migratory interests from the total fish and wildlife benefits.

ESTIMATES OF COST

94. GENERAL

A detailed cost estimate was obtained for the plan of improvement that would provide the most favorable benefit-cost ratio while providing the functions required for flood control and fish and wildlife interests. This plan, described in paragraphs 17 through 24, would consist of about 20 miles of channel improvement, replacement of several bridges, construction of weirs and control structures, construction of a gated retention structure across the lower end of the Canaseraga Valley and provision of fish and wildlife ponds upstream of the retention structure. The improvement would provide flood protection for the agricultural interests against a 5-year event on the "summer events" basis and would provide permanent ponding areas to serve the fish and wildlife interests.

95. COST ESTIMATE

Estimates of cost were based on costs of similar work in the Buffalo District and are adjusted to June 1967 price levels. Engineering, design, supervision and administration costs were based on costs of accomplishing similar work by this office. Table C25 shows estimated quantities and costs for the recommended plan of improvement. For use in allocation of costs, the table also shows estimates of cost for alternative single-purpose plans which would be necessary to provide equivalent flood control and fish and wildlife benefits.

TABLE C25. - Estimate of costs, June 1967 price levels

	Dual-purpose plan (Flood control and fish and wildlife)					Alternative single purpose plans	
	Quantity	Unit	Unit cost	Amount	Total	Flood control	Fish and wildlife
			$	$	$	$	$
LANDS							
Rights-of-way for construction and maintenance		LS		10,000		9,000	2,000
Lands purchased		LS		176,000		6,000	170,000
Contingencies		LS		35,000		3,000	33,000
Acquisition costs		LS		15,000		12,000	5,000
Total					236,000	30,000	210,000
RELOCATIONS							
Everman Road bridge		LS		63,200			
Pioneer Road bridge		LS		47,200			
Farm bridges - replace							
No. 1		LS		47,800			
No. 2		LS		37,700			
No. 6		LS		41,300			
Farm bridges - remove No's 2, 3, & 5	3	Ea.	500.00	1,500			
Contingencies				51,800			
Total					310,500	310,500	-
CHANNELS							
Clearing	152	Acre	500.00	76,000			
Excavation - channels							
Canaseraga Creek	3,046,000	CY	0.55	1,675,300			
Keshequa Creek	58,500	CY	0.55	32,175			
Bradner Creek	71,700	CY	0.55	39,440			
State Canal	22,100	CY	0.55	12,155			
Excavation - riprap	22,290	CY	1.20	26,750			
Riprap, 18"	16,720	CY	15.25	254,980			
Filter blanket, 16"	5,570	CY	5.00	27,850			
Weir No. 1		LS		41,200			
Weir No. 2		LS		13,400			
Weir No. 3		LS		26,500			
Control Str. No. 1		LS		25,700			
Control Str. No. 2		LS		54,300			
Seeding, mulching and fertilizing	153	Acre	650.00	99,450			
Contingencies				480,800			
Total					2,886,000	2,886,000	-
LEVEE							
Stripping	3,800	CY	0.80	3,040			
Excavation - borrow	36,300	CY	0.45	16,335			
Compacted embankment	30,200	CY	0.35	10,570			
Seeding, mulching and fertilizing	6	Acre	650.00	3,900			
Contingencies				6,655			
Total					40,500	40,500	-
RETENTION STRUCTURE							
Earth dam							
Clearing		LS		30,000			
Stripping	42,500	CY	0.80	34,000			
Inspection trench	12,525	LF	1.50	18,788			
Excavation - borrow	473,600	CY	0.45	213,120			
Excavation - riprap	1,500	CY	1.20	1,800			
Compacted embankment	394,672	CY	0.30	118,402			
Riprap, 36"	22,250	CY	15.25	339,313			
Filter blanket, 24"	13,500	CY	5.00	67,500			
Piling, MP-22	704,000	Lbs	0.25	176,000			
Seeding, mulching and fertilizing	22	Acre	650.00	14,300			
Access road, ROB gravel	5,800	CY	0.45	2,610			
Access road, compacted	4,800	CY	0.30	1,440			
Miscellaneous items				101,727			
Spillway and Outlet works							
Care of water		LS		25,000			
Excavation - structural	25,000	CY	1.20	30,000			
Steel bearing piles	230	Ea.	795.00	182,850			
Piling cut-off, MA-22	25,750	Lbs	0.25	6,433			
Concrete - spillway	6,100	CY	26.00	158,600			
Concrete - outlet works	418	CY	60.00	25,080			
Portland cement	8,963	Bbl	5.00	44,815			
Steel reinforcement	586,620	Lbs	0.13	76,261			
Riprap	2,000	CY	15.25	30,500			
Tainter gates	2	Ea.	100,000.00	200,000			
Slide gates	3	Ea.	5,000.00	15,000			
Machinery house		LS		3,000			
Service bridge	106	LF	64.00	6,784			
Steel stairs		LS		2,500			
Steel pipe railing	280	LF	10.00	2,800			
Miscellaneous items				80,977			
Contingencies				400,400			
Total					2,410,000	2,410,000	2,410,000
FISH & WILDLIFE PONDS							
Embankment							
Stripping	72,750	CY	0.80	58,200			
Excavation - borrow	391 400	CY	0.45	176,130			
Compacted emnenkment	326,104	CY	0.35	114,136			
Inspection trench	43,970	LF	1.50	65,955			
Seeding, mulching and fertilizing	45	Acre	650.00	29,250			
Outlet works & Pumping Stations							
Excavate & backfill	1,140	CY	3.50	3,990			
Concrete	355	CY	70.00	24,850			
Portland Cement	488	Bbl	5.00	2,440			
6" Concrete paving	320	SF	0.90	288			
Metal building, Pond I		LS		1,450			
Metal building, Pond II		LS		1,250			
5,000 gpm pump, Pond I		LS		5,500			
2,000 gpm pump, Pond II		LS		2,900			
Sluice gates, Pond I	2	Ea.	5,300.00	10,600			
Sluice gates, Pond II	1	Ea.	4,200.00	4,200			
Electrical power supply	5,000	LF	3.00	15,000			
Steel reinforcement	24,850	Lbs	0.13	3,230			
Miscellaneous items				8,031			
Contingencies				105,600			
Total					633,000	-	633,000
ENGINEERING AND DESIGN					580,000	513,000	307,000
SUPERVISION AND ADMINISTRATION					370,000	330,000	180,000
GRAND TOTAL FIRST COSTS					7,466,000 (1)	6,520,000	3,740,000
ANNUAL OPERATIONS AND MAINTENANCE							
Channels (2)					15,000	15,000	-
Retention structure (3)					6,500	6,500	6,500
Fish and Wildlife ponds					2,000	-	2,000
Inspections					200	150	50
Total					23,700	21,650	8,550

(1) First costs excludes the cost for preauthorization studies.
(2) Includes cost of maintaining channels and all appurtenances.
(3) Includes operations costs of $2,500.

96. PROJECT FORMULATION

A design discharge of 7,300 cfs at Shakers Crossing was used to design the channels for the recommended plan of improvement. It has a frequency of recurrence of 5 years on the "summer events" basis. Allocation of costs for the improvement was made on the basis of benefits expected from flood control and fish and wildlife. The proposed dual-purpose project would have a benefit-cost ratio based on allocated costs of 1.2 to 1. A plan of improvement providing 10-year flood protection would result in a substantial increase in first costs and a minimal increase in flood control benefits indicating that further increments in the degree of flood protection would further decrease the above ratio. The fish and wildlife benefits, on which the above benefit-cost ratio is based, assumes that Temporary Pond III (see plate C10) would not be drained prior to 15 May of each year. Earlier draining of this pond would decrease the above benefit-cost ratio.

PROPOSED LOCAL COOPERATION

97. GENERAL POLICY

In accordance with current policy for local improvement projects for flood control, responsible local interests would be required to furnish assurances that they will:

a. Provide without cost to the United States all lands, easements and rights-of-way necessary for the construction and maintenance of the flood control portion of the project;

b. Hold and save the United States free from all claims for damages incident to construction and operation of the project;

c. Take over, maintain and provide for operation of the project, after completion, in accordance with regulations prescribed by the Secretary of the Army:

d. Provide without cost to the United States all relocations of highways, highway bridges, buildings, and special facilities and;

e. Prescribe and enforce regulations to prevent encroachment on channels and on rights-of-way necessary to proper functioning of the project.

98. Public Law 89-72, dated 9 July 1965, requires that non-Federal interests bear not less than one-half of the separable costs of the project allocated to fish and wildlife enhancement. It was considered that the lands required for the permanent fish and wildlife ponds (see plate C10) would be separable costs to be allocated to fish and wildlife. On this basis, responsible local interests would be required to furnish assurances that they will bear 50 percent of the cost of lands necessary for the establishment of the fish and wildlife ponds in addition to 50 percent of the cost of the structures required to establish the ponds.

ALLOCATION OF COSTS

99. GENERAL

Initial studies on Canaseraga Creek were directed toward development of plans to alleviate the flood problem. The flood control plan developed for protection of the Canaseraga Valley requires a retention structure to control the outflow from Canaseraga Creek into the Genesee River. This feature would be common to a fish and wildlife improvement by providing a controlled ponding area to be used by waterfowl. No changes in the plan of improvement for flood control would be required. However, certain features would be added to the improvement to obtain the recreational benefits from fish and wildlife. Sizable benefits would be realized from the use of the improvement by fish and wildlife interests. Studies were made to determine the amount of benefits that would result if the fish and wildlife use was developed with flood control in a dual-purpose project, and to determine the appropriate related allocation of project costs between the purposes.

100. Costs of the dual-purpose project were allocated first to each purpose, and then apportioned between Federal and non-Federal interests.

101. ESTIMATE OF COSTS AND BENEFITS FOR MULTIPLE-PURPOSE PROJECT

Table C26, following, summarizes the estimated first costs, annual maintenance costs and annual benefits for a multiple-purpose project.

TABLE C26. - Estimate of costs and benefits for multiple-purpose project

Construction costs:	
Lands	$ 236,000
Relocations	310,500
Channels	2,886,000
Levee	40,500
Retention structure	2,410,000
Fish and wildlife facilities	633,000
Engineering and design	580,000
Supervision and administration	370,000
Total	$7,466,000
Annual operations and maintenance costs:	$ 23,700
Annual benefits:	
Flood control	$ 194,870
Fish and wildlife	197,900
Total	$ 392,770

102. For allocation, flood control and fish and wildlife were considered the purposes of the project. Costs for project facilities needed to fully develop these two purposes were allocated to these purposes on the basis of separable costs and remaining benefits. All computations to determine annual charges for allocation of the first costs assumed an interest rate of 3-1/8 percent and a 50-years life. For all features, a two-year construction period was assumed, and interest for one year was added to first costs to determine investment costs.

103. As the first step in allocation of costs to the purposes, estimates of costs were developed for alternate projects which would produce single-purpose benefits equal to those produced by the dual-purpose project (see table C25). The total estimated first and annual costs for alternative single-purposes flood control and fish and wildlife projects are given in table C27. In the allocation, made on the basis of annual costs, the amount allocable to each purpose was limited by these alternate annual charges or by the related benefits, which ever were smaller. The single-purpose flood control project would not be justified, so allocation of the dual-purpose project costs to that purpose was limited by the flood control benefits developed.

TABLE C27. Annual charges for alternative single purpose projects

Item	Flood control	Fish and wildlife
	$	$
First cost	6,520,000	3,740,000
Interest during construction	203,800	116,900
Investment	6,723,800	3,856,900
Annual charges:		
Interest	210,120	120,530
Amortization	57,420	32,940
Operation and maintenance	21,650	8,550
Total	289,190	162,020

104. Next, separable first costs and annual costs for each purpose were obtained by subtracting the costs of the alternate single-purpose plan from the costs of the dual-purpose project. The estimated separable first costs and separable annual costs for each purpose are given in table C28.

TABLE C28. - Annual charges for separable project costs

	Dual-purpose project			
	Separable costs			
	Flood control	Fish and wildlife	Joint use costs	Total
ESTIMATED COSTS				
	$	$	$	$
Construction expenditures	3,726,000(1)	946,000(2)	2,794,000	7,466,000
Interest during construction	116,400	29,600	87,300	233,300
Investment	3,842,400	975,600	2,881,300	7,699,300
Annual charges:				
Interest	120,080	30,490	90,040	240,610
Amortization	32,810	8,330	24,610	65,750
Operation and maintenance	15,150	2,050	6,500	23,700
Total	168,040	40,870	121,150	330,060

(1) Estimated first costs for single purpose fish and wildlife project = $3,740,000

(2) Estimated first costs for single purpose flood control project = $6,520,000

105. Finally, the separable annual costs were subtracted from the annual benefits limited as described in paragraph 103. The non-separable dual-purpose project costs were allocated in proportion to the amounts of remaining benefits.

106. Annual costs of operation and maintenance of the dual-purpose project were estimated and allocated by the same method as the annual construction charges. The separable annual maintenance costs were assigned directly to their respective purposes. The remaining (joint) annual maintenance costs were then allocated on the basis of the benefits remaining after total separable annual costs were subtracted.

107. The allocated maintenance costs were subtracted from the allocated total annual costs, and the total first costs allocated to each purpose in proportion to the remainder. The allocation computations as described above are shown in table C29.

TABLE C29. - Allocation of costs to purposes

	Flood control	Fish and Wildlife	Dual purpose
ALLOCATION COMPUTATION			
	$	$	$
First costs, alternative projects	6,520,000	3,740,000	7,466,000
Annual charges including operations and maintenance, alternative projects	289,190	162,020	330,060
Annual maintenance, alternative projects	21,650	8,550	23,700
Total annual benefits	194,870	197,900	392,770
Allocation of annual charges dual-purpose project:			
1. Benefits	194,870	197,900	
2. Alternative costs	289,190	162,020	
3. Benefits limited by alternative costs	194,870	162,020	
4. Separable costs	168,040	40,870	208,910
5. Remaining benefits	26,830	121,150	147,980
6. % distribution of item 5	18.13	81.87	100.00
7. Allocated joint costs	21,960	99,190	121,150
8. Total allocation	190,000	140,060	330,060
Allocation of maintenance, dual-purpose projects:			
9. Separable costs	15,150	2,050	17,200
10. % joint costs, item 6	18.13	81.87	100.00
11. Allocated joint costs	1,180	5,320	6,500
12. Total allocation	16,330	7,370	23,700
Allocation of first costs, dual-purpose project:			
13. Allocated annual charges	190,000	140,060	330,060
14. Allocated maintenance	16,330	7,370	23,700
15. Remainder	173,670	132,690	306,360
16. % distribution of item 15	56.69	43.31	100.00
17. Allocated first costs	4,232,500	3,233,500	7,466,000

108. APPORTIONMENT OF COSTS TO INTERESTS

The estimated apportionment of costs to interests for the dual-purpose project was based on the following criteria:

a. Flood control - The non-Federal share of the flood control costs would include the costs of lands, easements and rights-of-way, necessary relocations (excluding removal of three farm bridges) and the annual maintenance cost allocated to flood control less $150 for Federal inspections. On this basis, the non-Federal flood control costs would be $27,000 for lands, $309,000 for relocations and annual maintenance charges amounting to $16,180. The remaining flood control costs would be Federal.

b. Fish and Wildlife - The non-Federal share of the fish and wildlife costs would include one-half of the separable costs chargeable to fish and wildlife and the annual operations and maintenance cost allocated to fish and wildlife less $50 for Federal inspections. Therefore, the non-Federal share of the fish and wildlife first costs of $946,000 would include separable costs of $473,000, including 50 percent of the land costs, and annual operations and maintenance costs would be $7,320. The remaining costs would be Federal.

109. Based on the allocation shown in table C29, non-Federal interests would be allocated $809,000 of the $7,466,000 first costs for the development of the two project purposes. Of this amount, $440,000 represents costs of lands and relocations. The balance of the non-Federal responsibility, $369,000 may be met by a cash contribution toward Federal construction costs, construction of equivalent work or any suitable combination thereof.

110. The total estimated cost for operation and maintenance of the multiple-purpose project would be $23,700. In accordance with the allocation to project purposes, responsibility for maintenance costs would be divided between Federal and non-Federal interests as follows:

TABLE C30. - Allocation of operations and maintenance costs

Item	Federal	Non-Federal(1)	Total
	$	$	$
Flood control	150	16,180	16,330
Fish and wildlife	50	7,320	7,370
	200	23,500	23,700

(1) Includes $2,500 for providing for operation of the retention structure which may be accomplished by federal interests

111. The final breakdown of the first and annual costs for the two purposes of the dual-purpose project, the applicable benefits, and the benefit-cost ratio for each purpose and for the dual-purpose project, is shown in table C31. All computations to determine annual charges assumed a Federal interest rate of 3-1/8 percent, a non-Federal interest rate of 3-1/8 percent and a 50-year project life. A two-year construction period was assumed for all features, and interest for one year was added to the first costs to determine the investment costs.

TABLE C31. - Summarized allocation

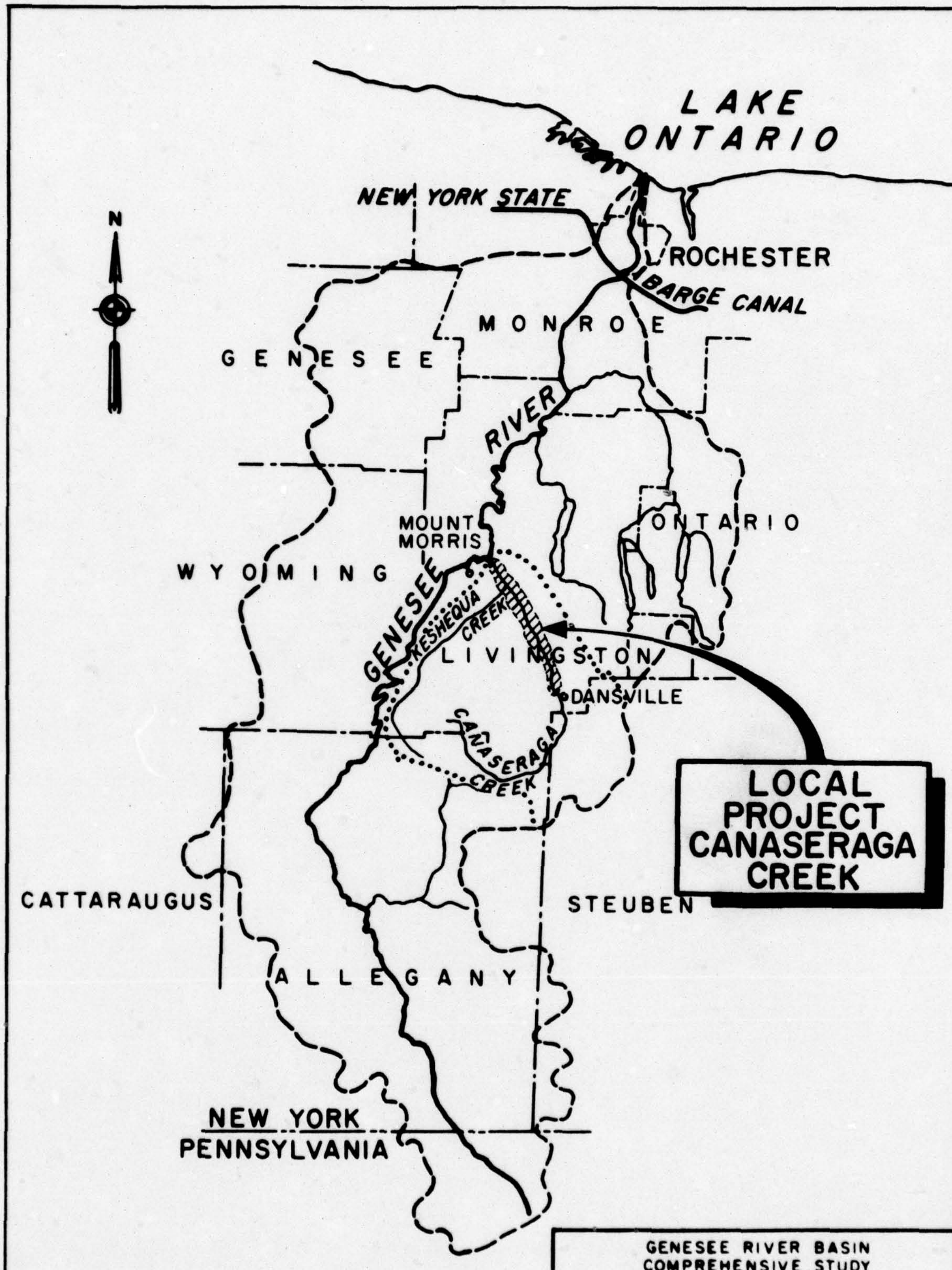
Item	Flood control	Fish and wildlife	Total
	$	$	$
ALLOCATED FIRST COSTS			
Federal	3,896,500	2,760,500	6,657,000
Non-Federal	336,000	473,000	809,000
	4,232,500	3,233,500	7,466,000
INVESTMENT COSTS			
Federal	4,018,200	2,846,800	6,865,000
Non-Federal	346,500	487,800	834,300
	4,364,700	3,334,600	7,699,300
ANNUAL COSTS			
Interest & amortization			
Federal	159,890	113,280	273,170
Non-Federal	13,780	19,410	33,190
Maintenance	16,330	7,370	23,700
	190,000	140,060	330,060
ANNUAL BENEFITS	194,870	197,900	392,770
BENEFIT-COST RATIO	1.03	1.4	1.2

CONCLUSION

112. A dual-purpose plan of improvement on Canaseraga Creek in the Canaseraga Valley from the mouth upstream to near Woodsville would be economically justifiable. The plan would consist of enlargement and straightening of approximately 20 miles of channels, provision of a retention structure with appurtenances near the downstream end of the study area and provision of fish and wildlife ponds upstream of the retention structure. This plan provides a feasible solution to the flood problem in the Canaseraga Valley and would produce sizable additional benefits attributable to fish and wildlife interests. Annual costs are estimated at $330,060 and annual benefits at $392,770. The ratio of benefits to costs would be 1.2 to 1.

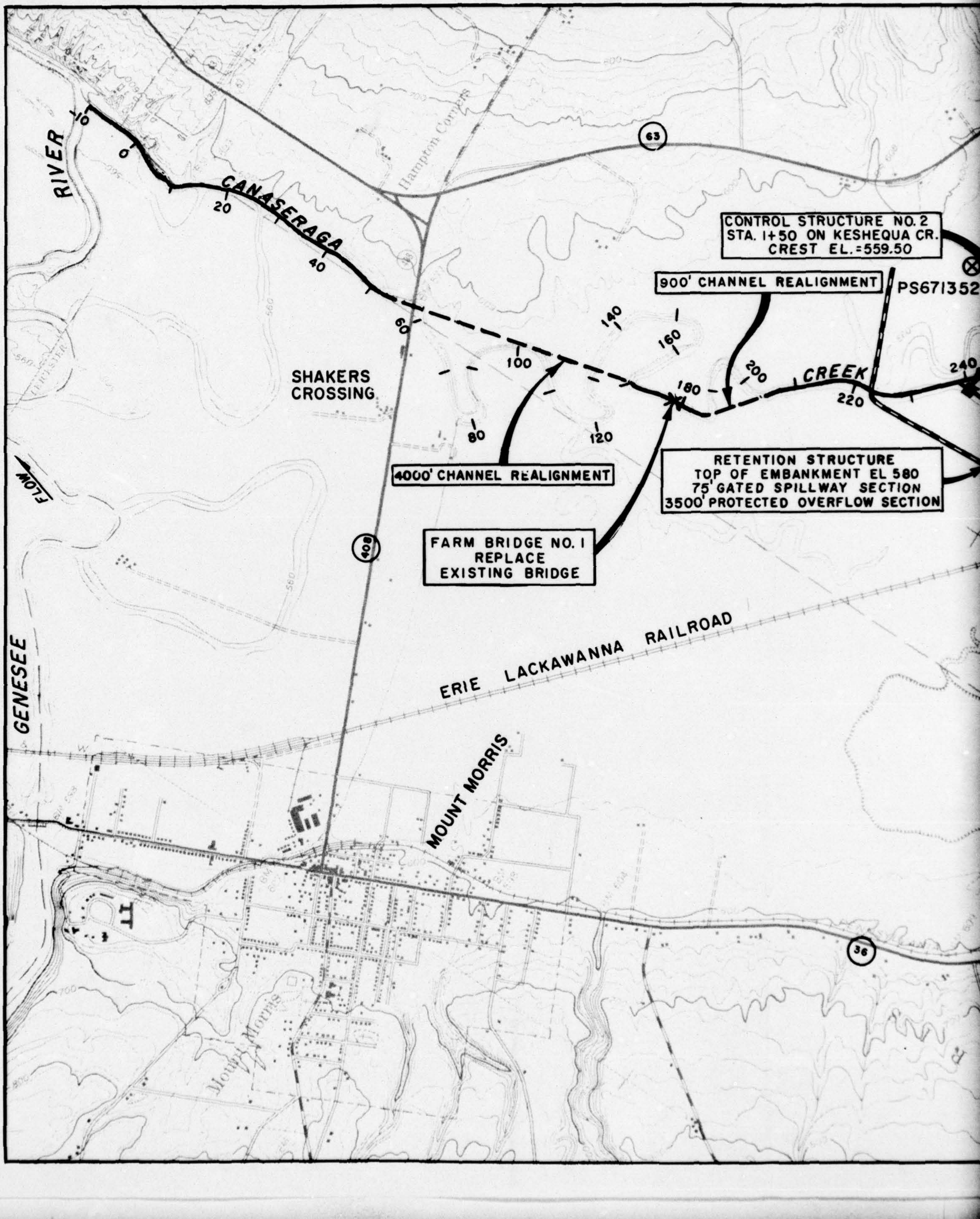
COORDINATION WITH OTHER AGENCIES

113. Determination of the plan of improvement for the local protection project on Canaserage Creek has been the responsibility of the Corps of Engineers through the chairing of Task Group No. 3. However, basic criteria for the proposed plan of improvement - e.g., the minimum degree of flood protection required, the ponding area requirements, etc. - were established by the Soil Conservation Service of the U. S. Department of Agriculture, the Bureau of Sport Fisheries and Wildlife of the Fish and Wildlife Service of the U. S. Department of Interior, and the Division of Fish and Game of the Department of Conservation of the State of New York. These agencies also provided considerable information from which the project benefits were determined.

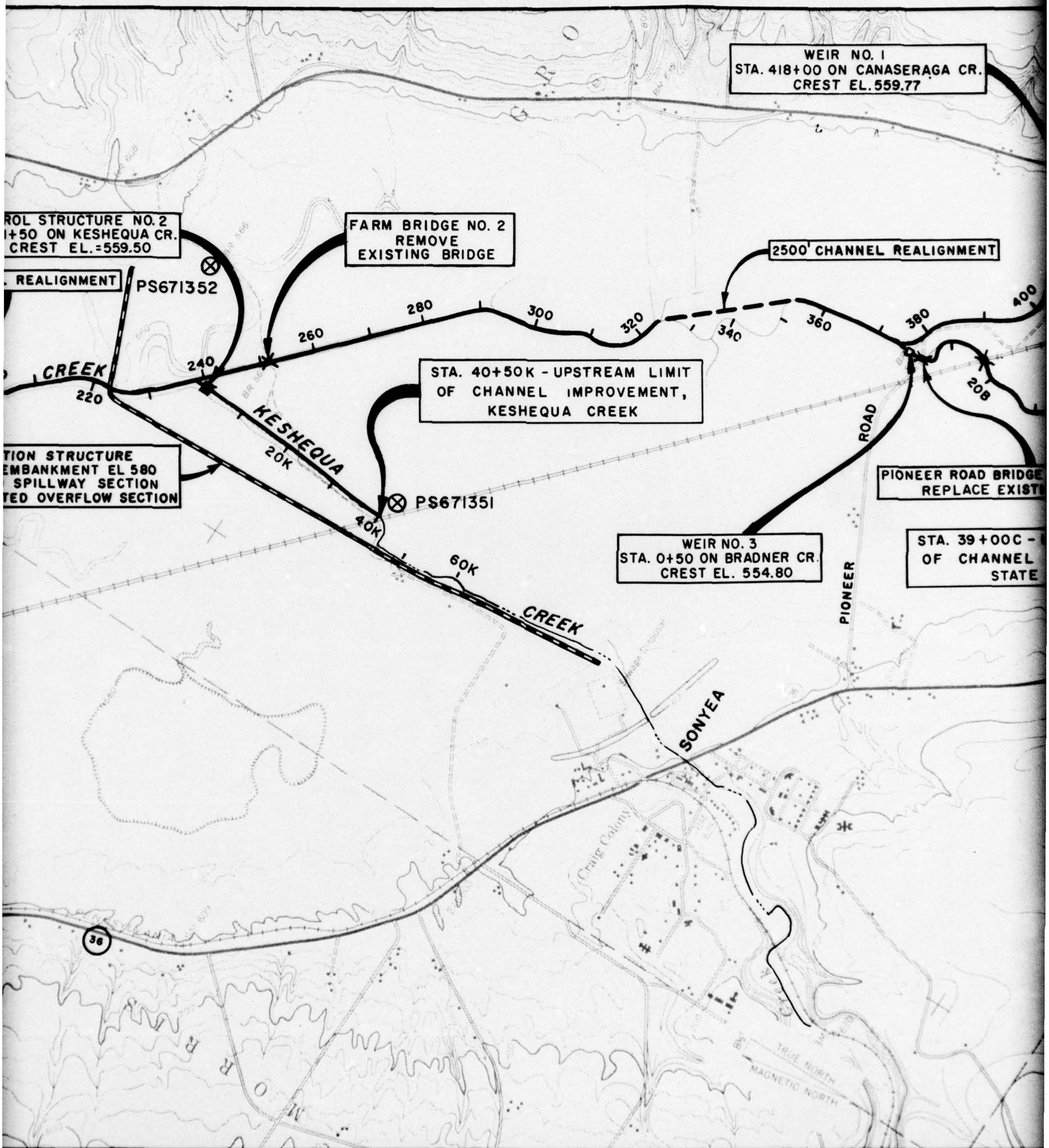


GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
LOCAL PROTECTION PROJECT
CANASERAGA CREEK
LOCATION MAP
U S ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

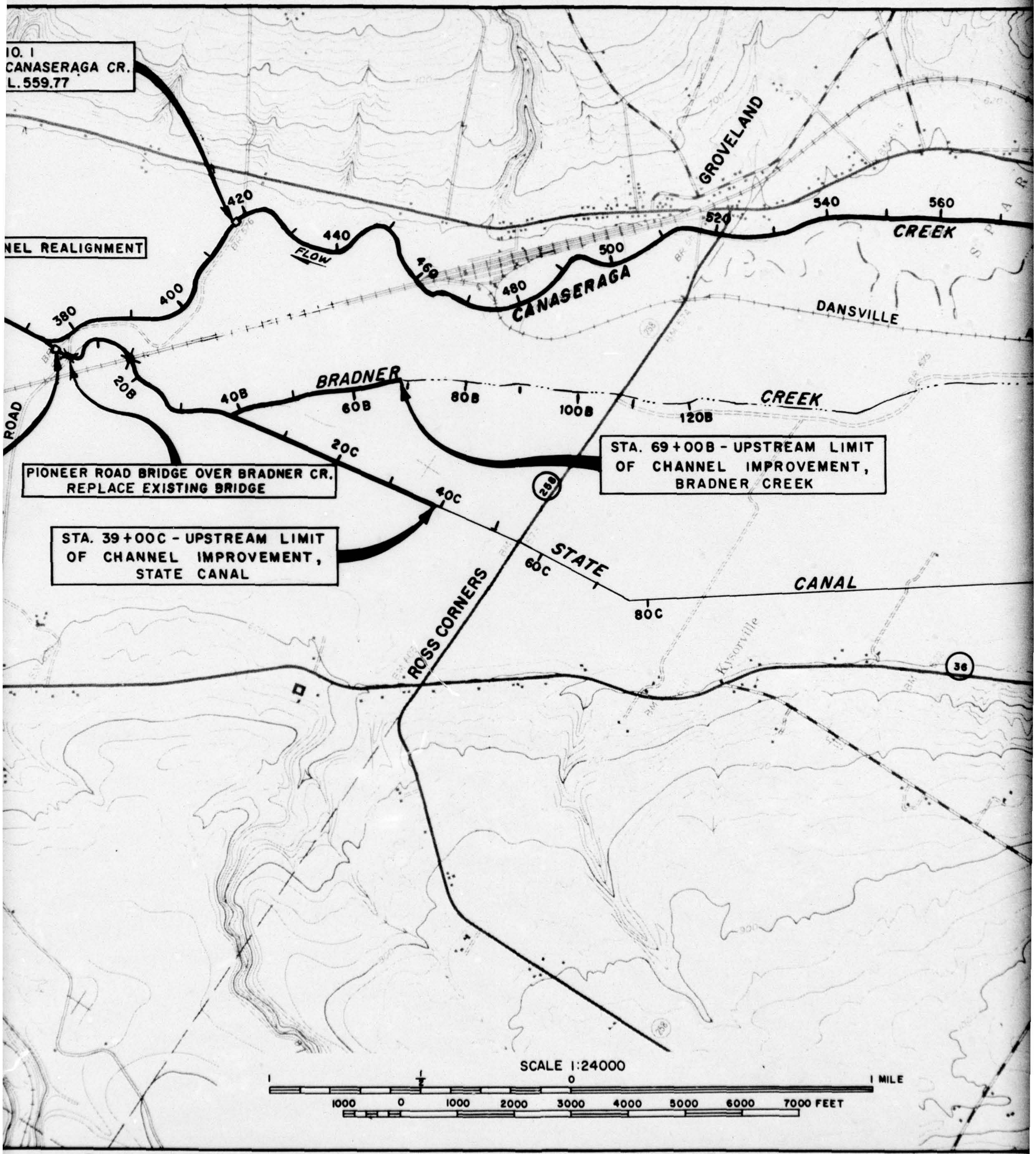
PLATE C1



CONTROL STRUCTURE NO. 2
STA. 1+50 ON KESHEQUA CR.
CREST EL.=559.50
PS671352
900' CHANNEL REALIGNMENT
RIVER
CANASERAGA
CREEK
SHAKERS CROSSING
4000' CHANNEL REALIGNMENT
FARM BRIDGE NO. 1
REPLACE
EXISTING BRIDGE
RETENTION STRUCTURE
TOP OF EMBANKMENT EL 580
75' GATED SPILLWAY SECTION
3500' PROTECTED OVERFLOW SECTION
FLOW
GENESEE
ERIE LACKAWANNA RAILROAD
MOUNT MORRIS
Hampton Corners
Mount Morris
63
408
36

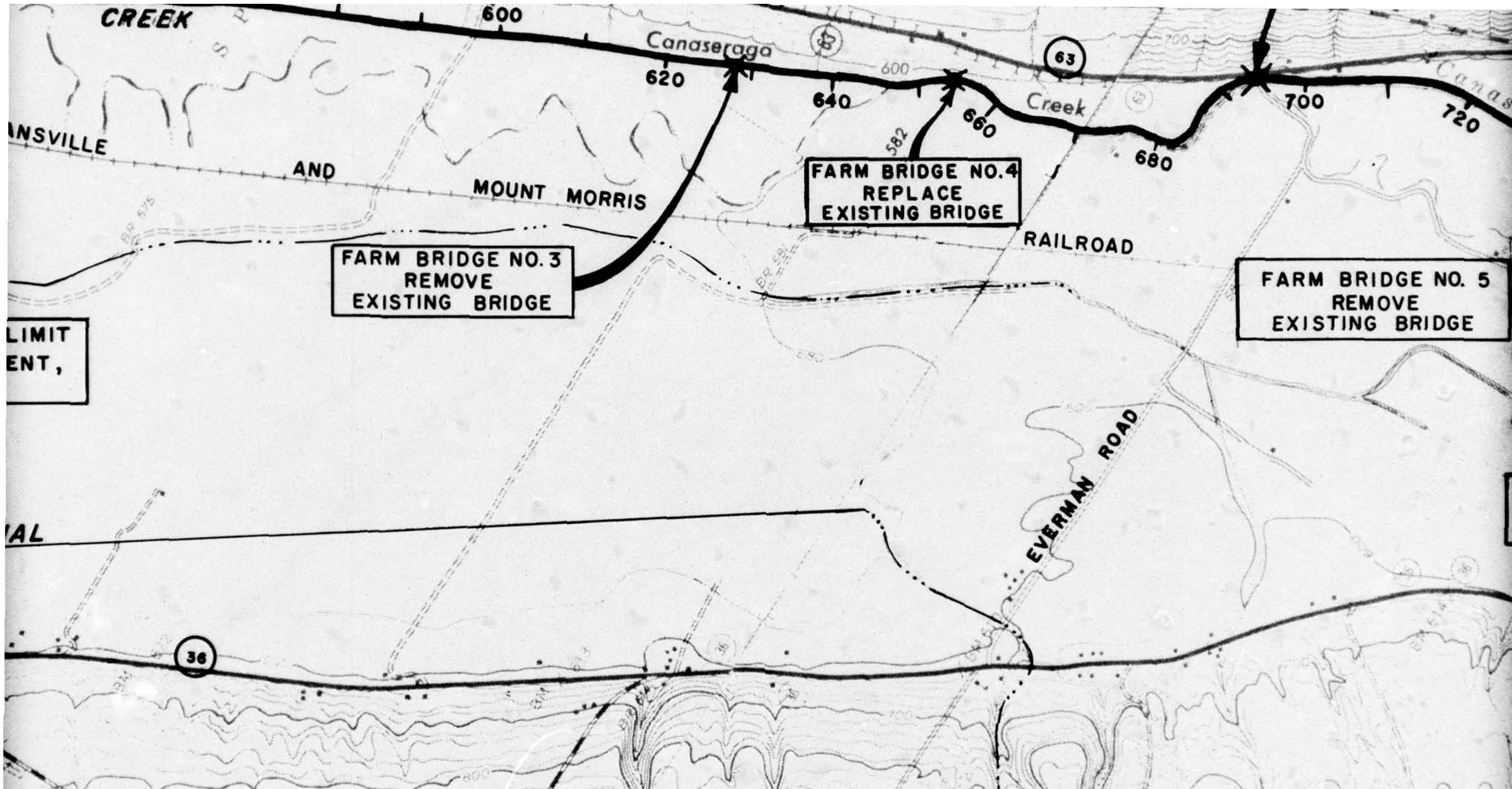


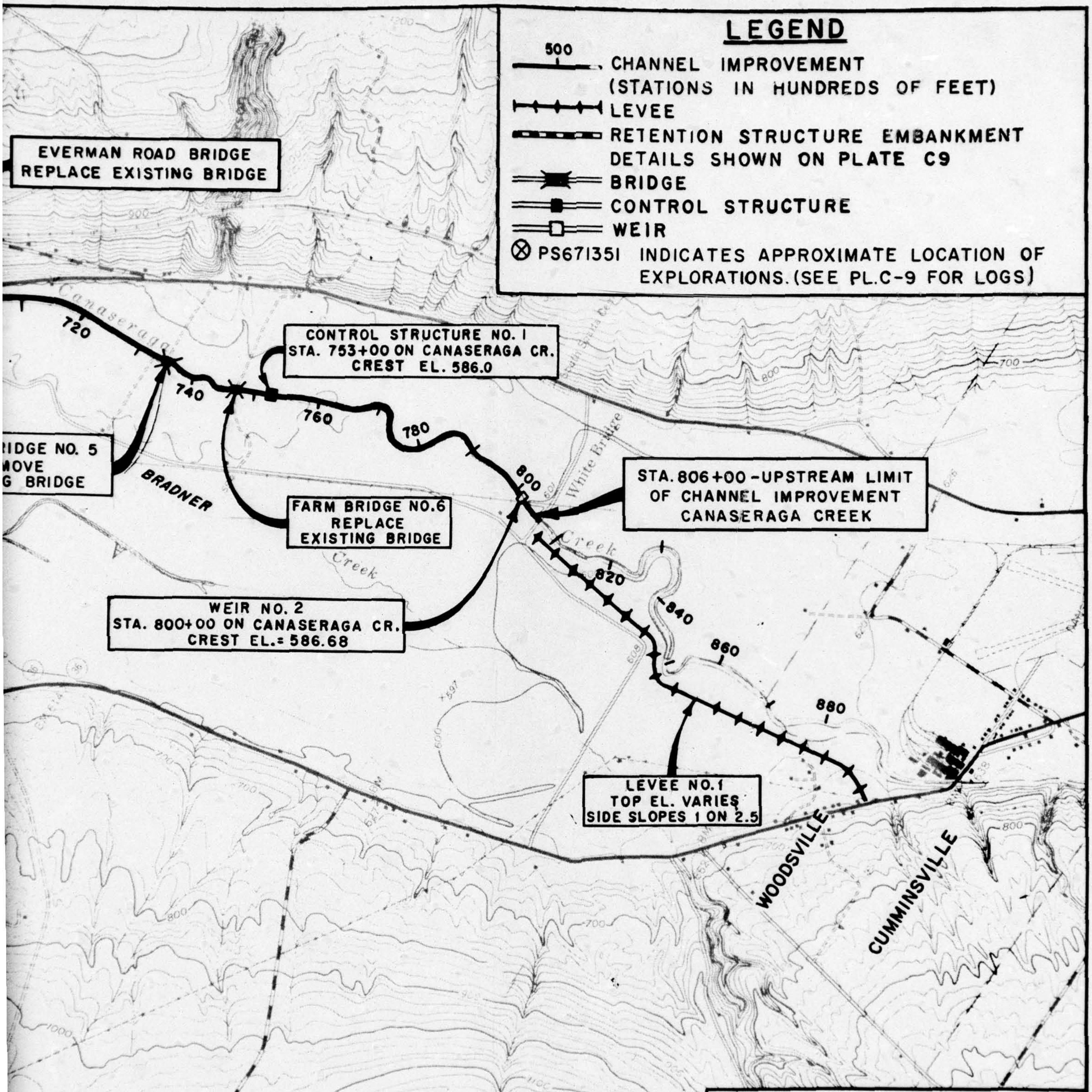
WEIR NO. 1
STA. 418+00 ON CANASERAGA CR.
CREST EL. 559.77
ROL STRUCTURE NO. 2
1+50 ON KESHEQUA CR.
CREST EL.=559.50
FARM BRIDGE NO. 2
REMOVE
EXISTING BRIDGE
2500' CHANNEL REALIGNMENT
. REALIGNMENT
PS671352
CREEK
220
240
260
280
300
320
340
360
380
400
208
STA. 40+50K - UPSTREAM LIMIT
OF CHANNEL IMPROVEMENT,
KESHEQUA CREEK
KESHEQUA
20K
40K
60K
CREEK
PS671351
TION STRUCTURE
EMBANKMENT EL 580
SPILLWAY SECTION
TED OVERFLOW SECTION
ROAD
PIONEER
PIONEER ROAD BRIDGE
REPLACE EXIST
WEIR NO. 3
STA. 0+50 ON BRADNER CR.
CREST EL. 554.80
STA. 39+00C -
OF CHANNEL
STATE
SONYEA
Craig Colony
36
TRUE NORTH
MAGNETIC NORTH



10. 1
CANASERAGA CR.
L. 559.77
NEL REALIGNMENT
GROVELAND
420
440
FLOW
460
480
500
520
540
560
CREEK
CANASERAGA
DANSVILLE
380
400
ROAD
BRADNER
20B
40B
60B
80B
100B
120B
CREEK
20C
40C
60C
80C
PIONEER ROAD BRIDGE OVER BRADNER CR.
REPLACE EXISTING BRIDGE
STA. 69+00B - UPSTREAM LIMIT
OF CHANNEL IMPROVEMENT,
BRADNER CREEK
258
STA. 39+00C - UPSTREAM LIMIT
OF CHANNEL IMPROVEMENT,
STATE CANAL
STATE
CANAL
ROSS CORNERS
Kysorville
36
SCALE 1:24000
1
1/2
0
1 MILE
1000
0
1000
2000
3000
4000
5000
6000
7000 FEET

3


CREEK
600
Canaseraga
620
640
600
63
660
Creek
680
700
720
Canase
ANSVILLE
AND
MOUNT MORRIS
RAILROAD
582
FARM BRIDGE NO.4
REPLACE
EXISTING BRIDGE
FARM BRIDGE NO.3
REMOVE
EXISTING BRIDGE
FARM BRIDGE NO. 5
REMOVE
EXISTING BRIDGE
LIMIT
ENT,
AL
EVERMAN ROAD
36
700
800
1000
1 MILE
ET

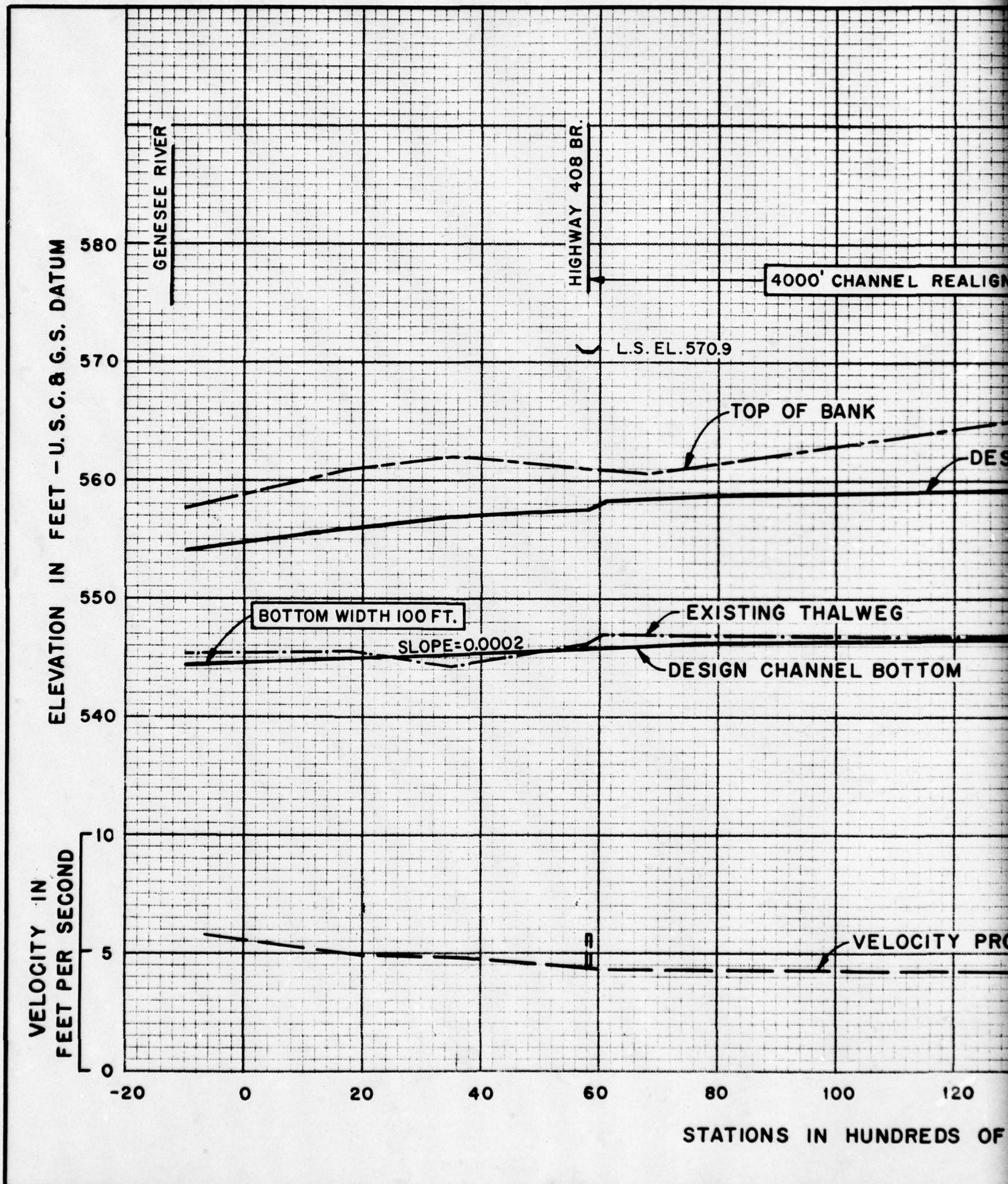


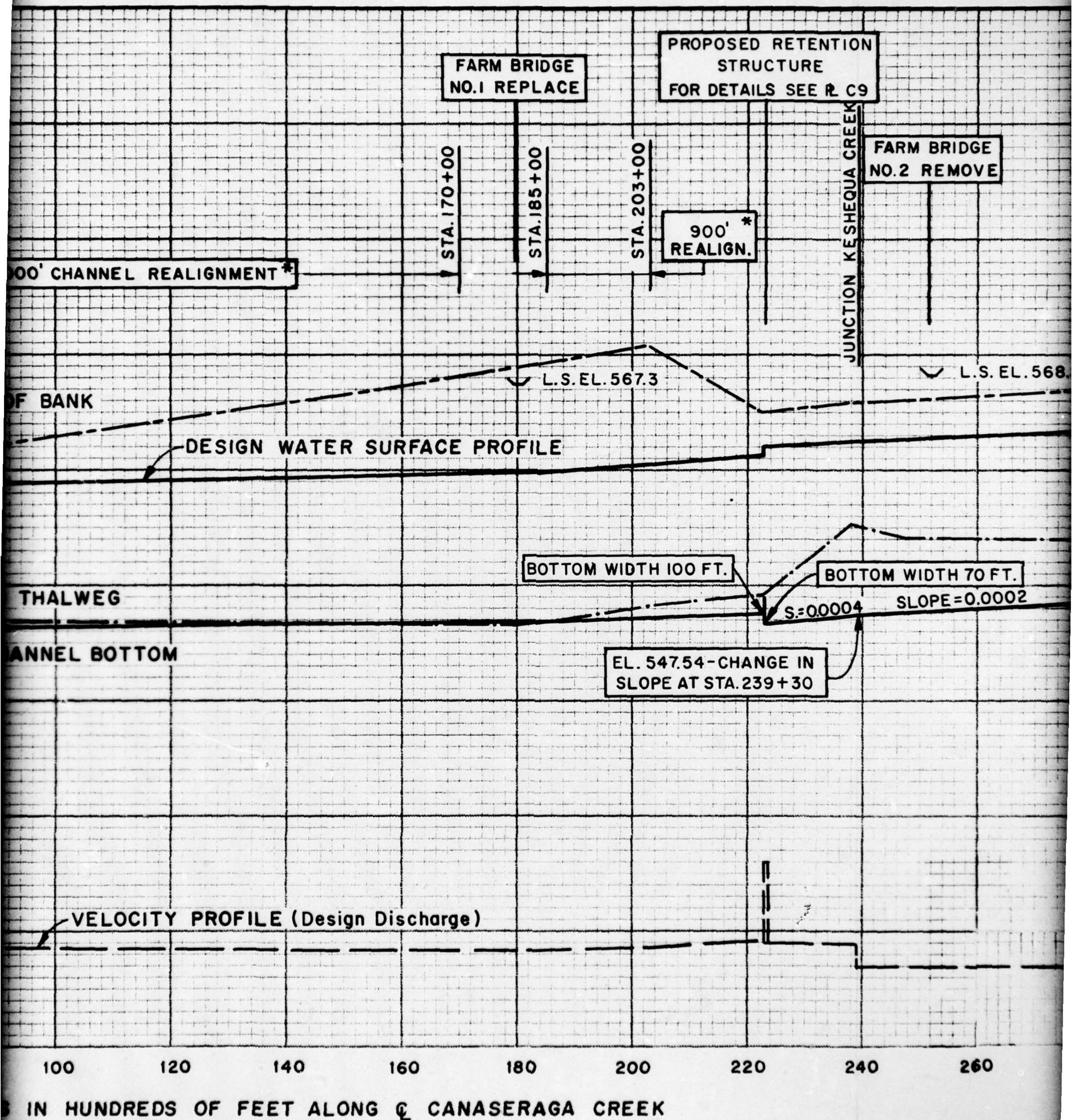
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

LOCAL PROTECTION PROJECT
CANASERAGA CREEK

PLAN OF IMPROVEMENT

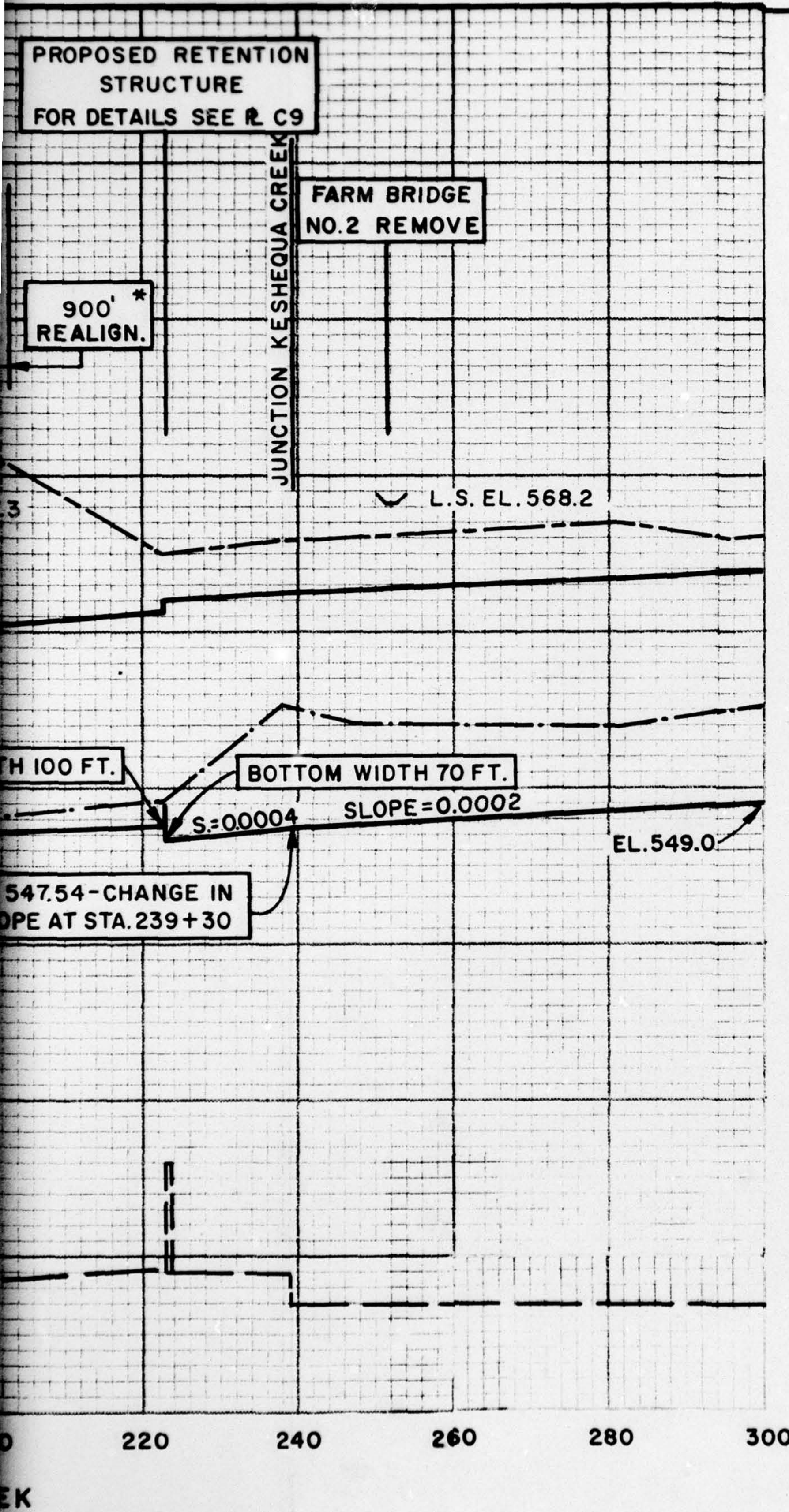
U.S. ARMY ENGINEER DISTRICT, BUFFALO


GENESEE RIVER
HIGHWAY 408 BR.
4000' CHANNEL REALIGN
L.S. EL. 570.9
TOP OF BANK
DES
BOTTOM WIDTH 100 FT.
EXISTING THALWEG
SLOPE=0.0002
DESIGN CHANNEL BOTTOM
VELOCITY PRO
ELEVATION IN FEET - U.S.C.&G.S. DATUM
580
570
560
550
540
VELOCITY IN FEET PER SECOND
10
5
0
-20
0
20
40
60
80
100
120
STATIONS IN HUNDREDS OF



FARM BRIDGE NO.1 REPLACE
PROPOSED RETENTION STRUCTURE FOR DETAILS SEE PL C9
FARM BRIDGE NO.2 REMOVE
JUNCTION KESHEQUA CREEK
STA.170+00
STA.185+00
STA.203+00
900' REALIGN. *
OO' CHANNEL REALIGNMENT *
L.S.EL.567.3
L.S.EL.568.
F BANK
DESIGN WATER SURFACE PROFILE
BOTTOM WIDTH 100 FT.
BOTTOM WIDTH 70 FT.
THALWEG
S.=0.0004
SLOPE=0.0002
ANNEL BOTTOM
EL.547.54-CHANGE IN SLOPE AT STA.239+30
VELOCITY PROFILE (Design Discharge)
100
120
140
160
180
200
220
240
260
IN HUNDREDS OF FEET ALONG ℄ CANASERAGA CREEK

2



LEGEND

FARM BRIDGE NO. 2 REMOVE — INDICATES PROPOSED IMPROVEMENTS.

NOTES

IMPROVED CHANNEL SIDE SLOPES TO BE 1 VERTICAL ON 2 1/2 HORIZONTAL.

DESIGN WATER SURFACE PROFILE IS BASED ON 5 YEAR "SUMMER EVENTS" FREQUENCY WITH MINIMUM GENESEE RIVER DISCHARGE AT JONES BRIDGE.

RIPRAPPED TRANSITIONS WOULD BE PROVIDED UPSTREAM OF BRIDGES.

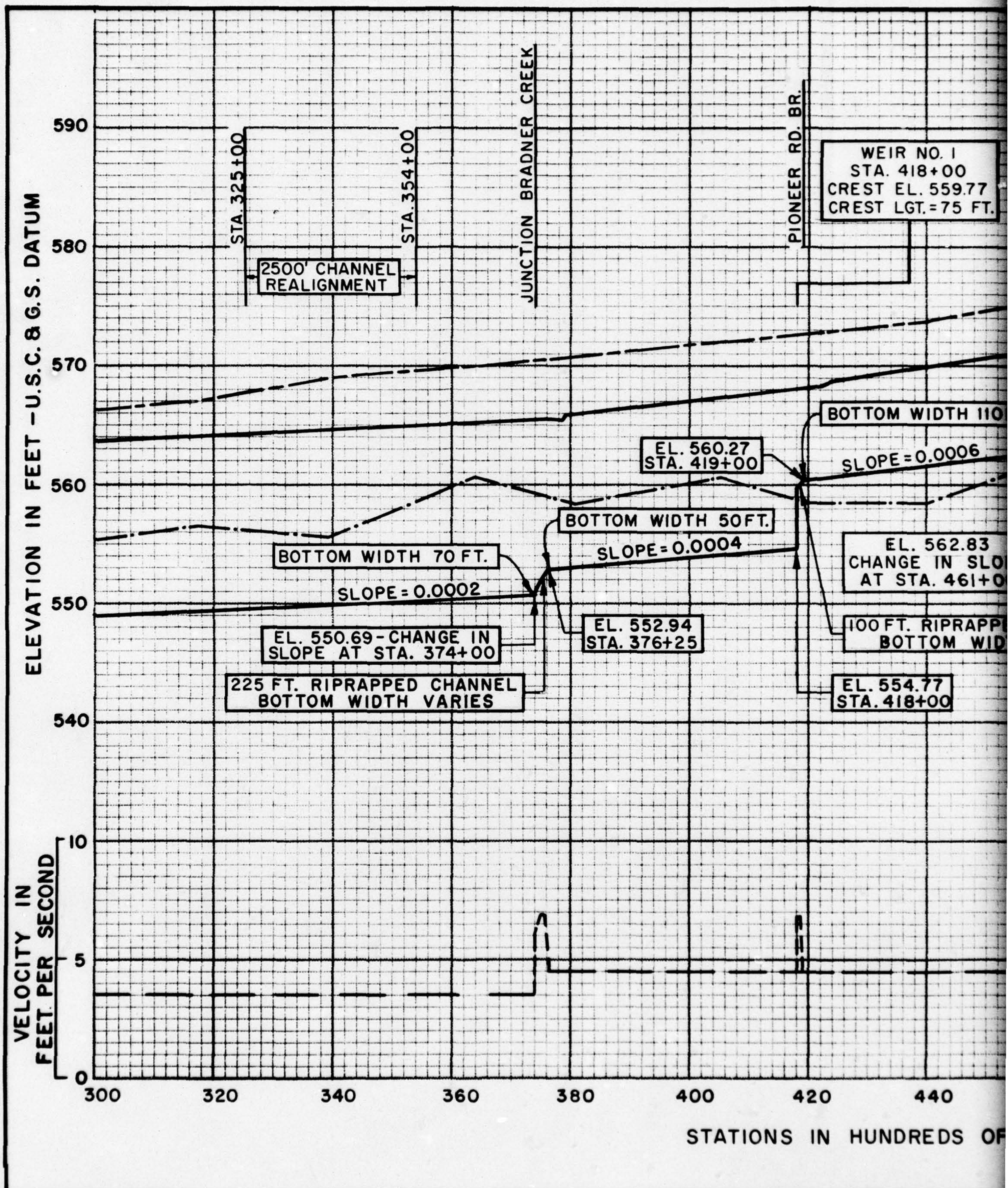
*SEE PLATE C2.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

LOCAL PROTECTION PROJECT
CANASERAGA CREEK

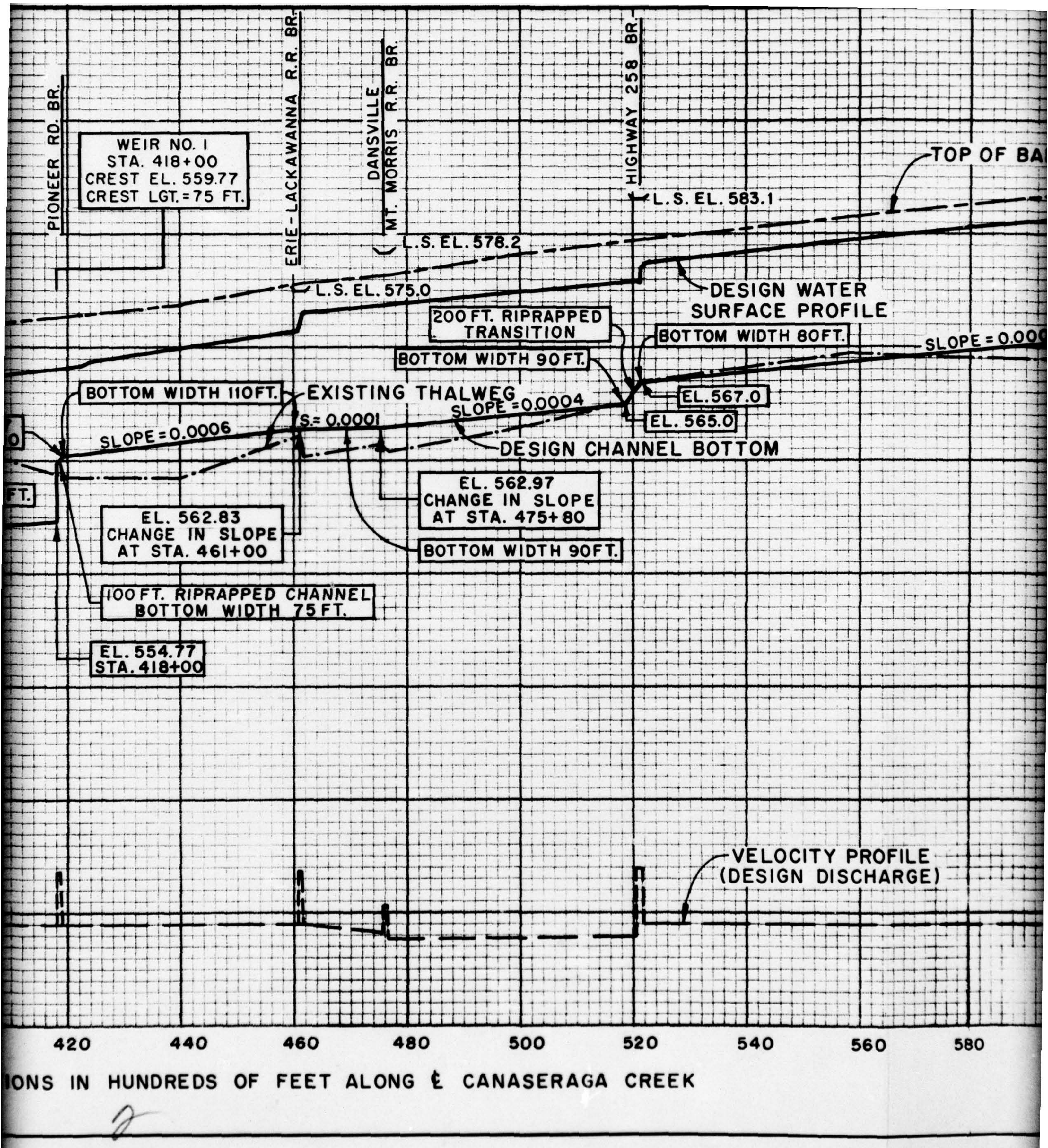
PROFILES-10+00 TO 300+00

U. S. ARMY ENGINEER DISTRICT, BUFFALO

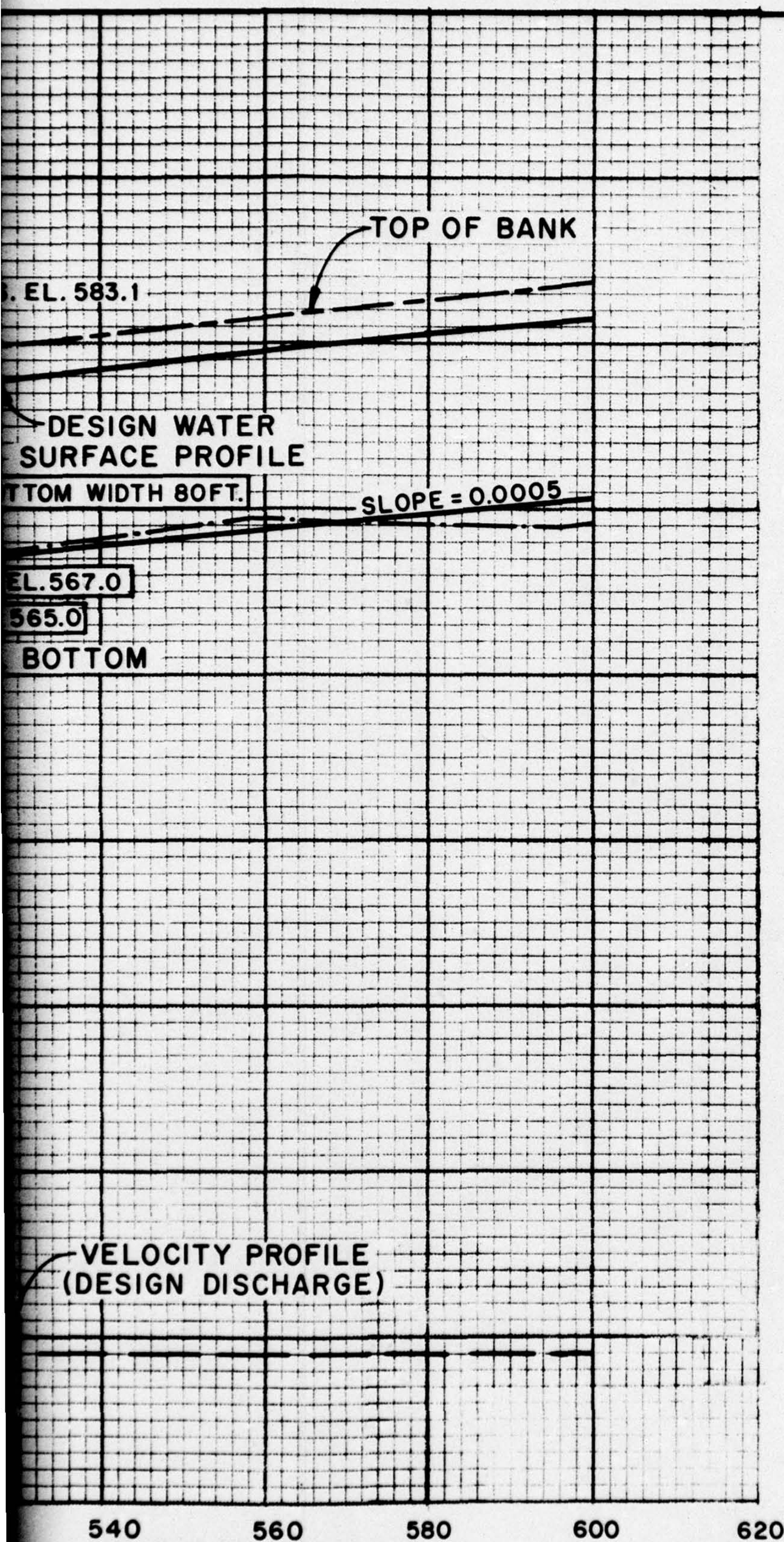


ELEVATION IN FEET - U.S.C. & G.S. DATUM
VELOCITY IN FEET PER SECOND
STATIONS IN HUNDREDS OF
STA. 325+00
STA. 354+00
2500' CHANNEL REALIGNMENT
JUNCTION BRADNER CREEK
PIONEER RD. BR.
WEIR NO. 1
STA. 418+00
CREST EL. 559.77
CREST LGT. = 75 FT.
BOTTOM WIDTH 110
EL. 560.27
STA. 419+00
SLOPE = 0.0006
BOTTOM WIDTH 50 FT.
BOTTOM WIDTH 70 FT.
SLOPE = 0.0004
SLOPE = 0.0002
EL. 562.83
CHANGE IN SLO
AT STA. 461+0
EL. 552.94
STA. 376+25
EL. 550.69 - CHANGE IN
SLOPE AT STA. 374+00
100 FT. RIPRAPPE
BOTTOM WID
225 FT. RIPRAPPED CHANNEL
BOTTOM WIDTH VARIES
EL. 554.77
STA. 418+00
590
580
570
560
550
540
10
5
0
300
320
340
360
380
400
420
440

1



PIONEER RD. BR.
WEIR NO. 1
STA. 418+00
CREST EL. 559.77
CREST LGT. = 75 FT.
ERIE-LACKAWANNA R.R. BR.
DANSVILLE
MT. MORRIS R.R. BR.
HIGHWAY 258 BR.
TOP OF BA
L.S. EL. 583.1
L.S. EL. 578.2
L.S. EL. 575.0
DESIGN WATER SURFACE PROFILE
200 FT. RIPRAPPED TRANSITION
BOTTOM WIDTH 80 FT.
BOTTOM WIDTH 90 FT.
SLOPE = 0.000
BOTTOM WIDTH 110 FT.
EXISTING THALWEG
EL. 567.0
SLOPE = 0.0004
EL. 565.0
S. = 0.0001
SLOPE = 0.0006
DESIGN CHANNEL BOTTOM
EL. 562.97
CHANGE IN SLOPE
AT STA. 475+80
EL. 562.83
CHANGE IN SLOPE
AT STA. 461+00
BOTTOM WIDTH 90 FT.
100 FT. RIPRAPPED CHANNEL
BOTTOM WIDTH 75 FT.
EL. 554.77
STA. 418+00
VELOCITY PROFILE
(DESIGN DISCHARGE)
420
440
460
480
500
520
540
560
580
IONS IN HUNDREDS OF FEET ALONG ℄ CANASERAGA CREEK



LEGEND:

WEIR NO. 1 STA. 418+00 CREST EL. 559.77	INDICATES PROPOSED IMPROVEMENTS

NOTES:

IMPROVED CHANNEL SIDE SLOPES TO BE 1 VERTICAL ON 2 1/2 HORIZONTAL.

DESIGN WATER SURFACE PROFILE IS BASED ON 5-YEAR "SUMMER EVENTS" FREQUENCY WITH MINIMUM GENESEE RIVER DISCHARGE AT JONES BRIDGE.

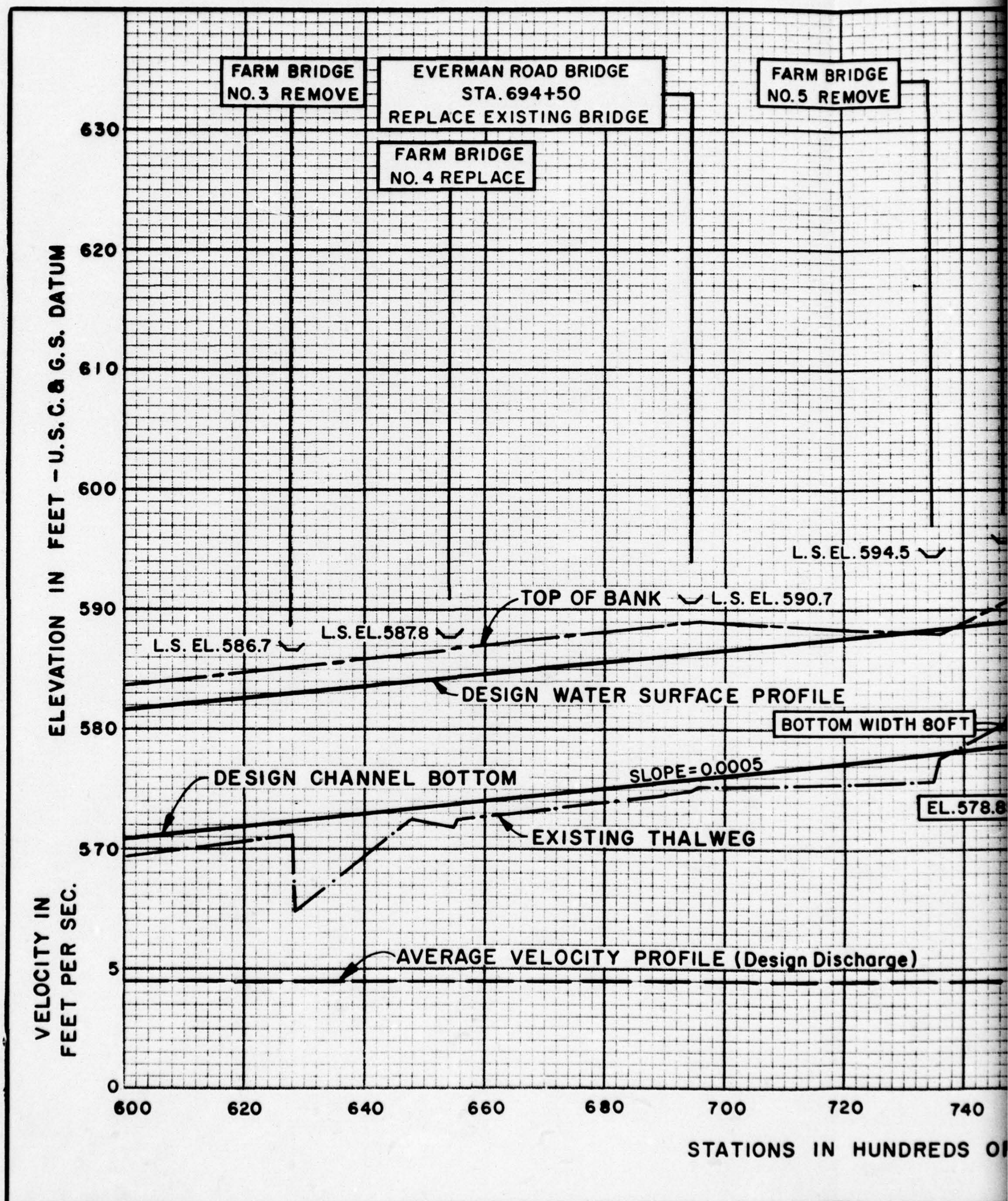
RIPRAPPED TRANSITIONS WOULD BE PROVIDED UPSTREAM AND DOWNSTREAM OF BRIDGES AND WEIRS.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

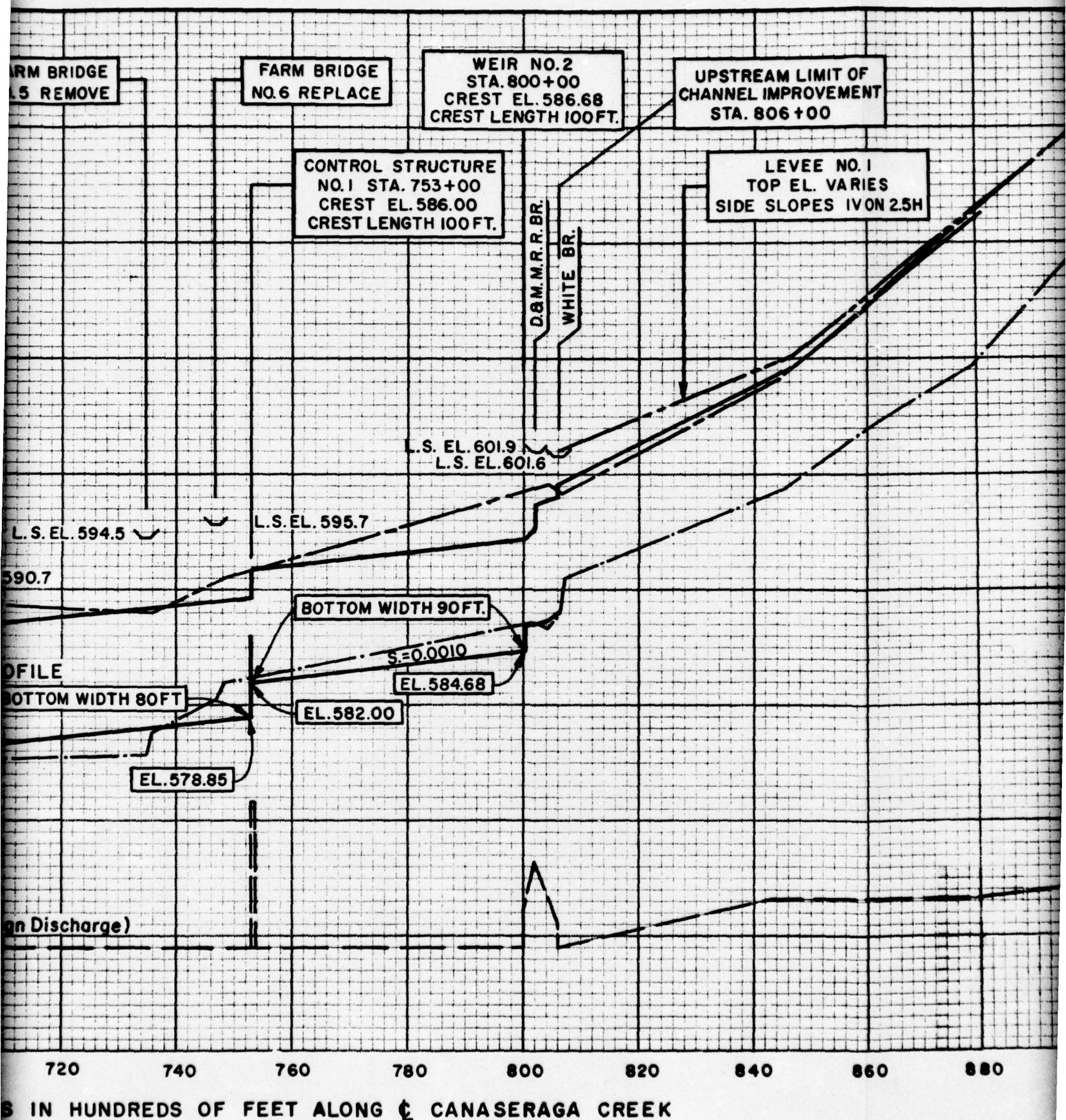
LOCAL PROTECTION PROJECT
CANASERAGA CREEK

PROFILES 300+00 TO 600+00

U. S. ARMY ENGINEER DISTRICT, BUFFALO

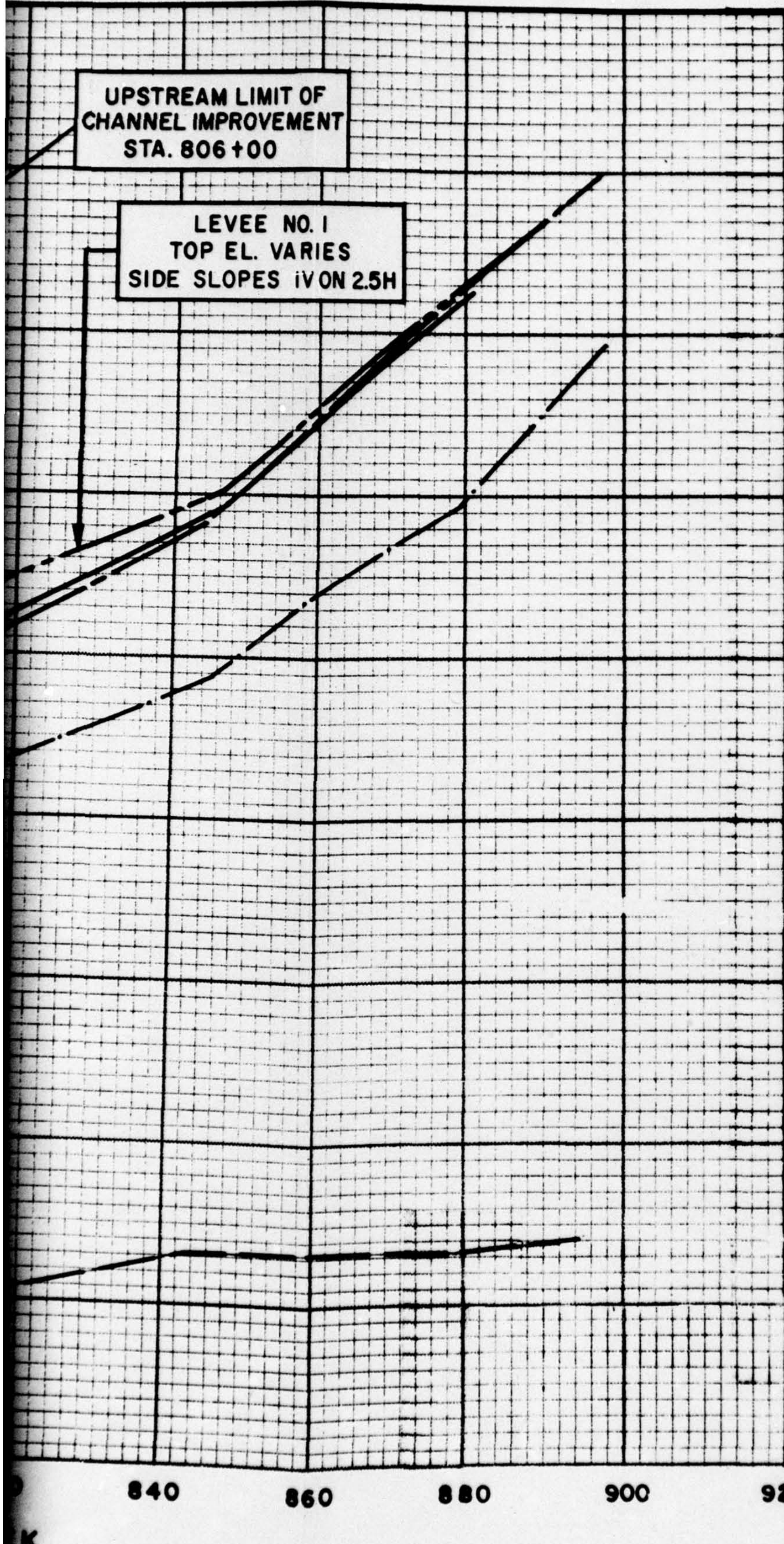


FARM BRIDGE NO.3 REMOVE
EVERMAN ROAD BRIDGE STA. 694+50 REPLACE EXISTING BRIDGE
FARM BRIDGE NO.5 REMOVE
FARM BRIDGE NO.4 REPLACE
630
620
610
600
590
580
570
5
0
ELEVATION IN FEET - U.S.C.& G.S. DATUM
VELOCITY IN FEET PER SEC.
L.S. EL. 594.5
TOP OF BANK
L.S. EL. 590.7
L.S. EL. 587.8
L.S. EL. 586.7
DESIGN WATER SURFACE PROFILE
BOTTOM WIDTH 80FT
SLOPE=0.0005
DESIGN CHANNEL BOTTOM
EL. 578.8
EXISTING THALWEG
AVERAGE VELOCITY PROFILE (Design Discharge)
600
620
640
660
680
700
720
740
STATIONS IN HUNDREDS O



ARM BRIDGE
.5 REMOVE
FARM BRIDGE
NO.6 REPLACE
WEIR NO.2
STA. 800+00
CREST EL. 586.68
CREST LENGTH 100 FT.
UPSTREAM LIMIT OF
CHANNEL IMPROVEMENT
STA. 806+00
CONTROL STRUCTURE
NO.1 STA. 753+00
CREST EL. 586.00
CREST LENGTH 100 FT.
LEVEE NO. 1
TOP EL. VARIES
SIDE SLOPES 1V ON 2.5H
D.&M.M.R.R. BR.
WHITE BR.
L.S. EL. 601.9
L.S. EL. 601.6
L.S. EL. 594.5
L.S. EL. 595.7
590.7
BOTTOM WIDTH 90 FT.
S.=0.0010
OFILE
BOTTOM WIDTH 80 FT
EL. 584.68
EL. 582.00
EL. 578.85
gn Discharge)
720
740
760
780
800
820
840
860
880
S IN HUNDREDS OF FEET ALONG ℄ CANASERAGA CREEK

2



LEGEND

LEVEE NO. 1
TOP EL. VARIES
SIDE SLOPES 1V ON 2.5H

INDICATES PROPOSED IMPROVEMENTS

NOTES

IMPROVED CHANNEL SIDE SLOPES TO BE 1 VERTICAL ON 2 1/2 HORIZONTAL.

DESIGN WATER SURFACE PROFILE IS BASED ON 5 YEAR "SUMMER EVENTS" FREQUENCY WITH MINIMUM GENESEE RIVER DISCHARGE AT JONES BRIDGE.

RIPRAPPED TRANSITIONS WOULD BE PROVIDED UPSTREAM AND DOWNSTREAM OF BRIDGES AND WEIRS.

TOP OF BANK DENOTES TOP OF LOW BANK AT THE GIVEN STATION.

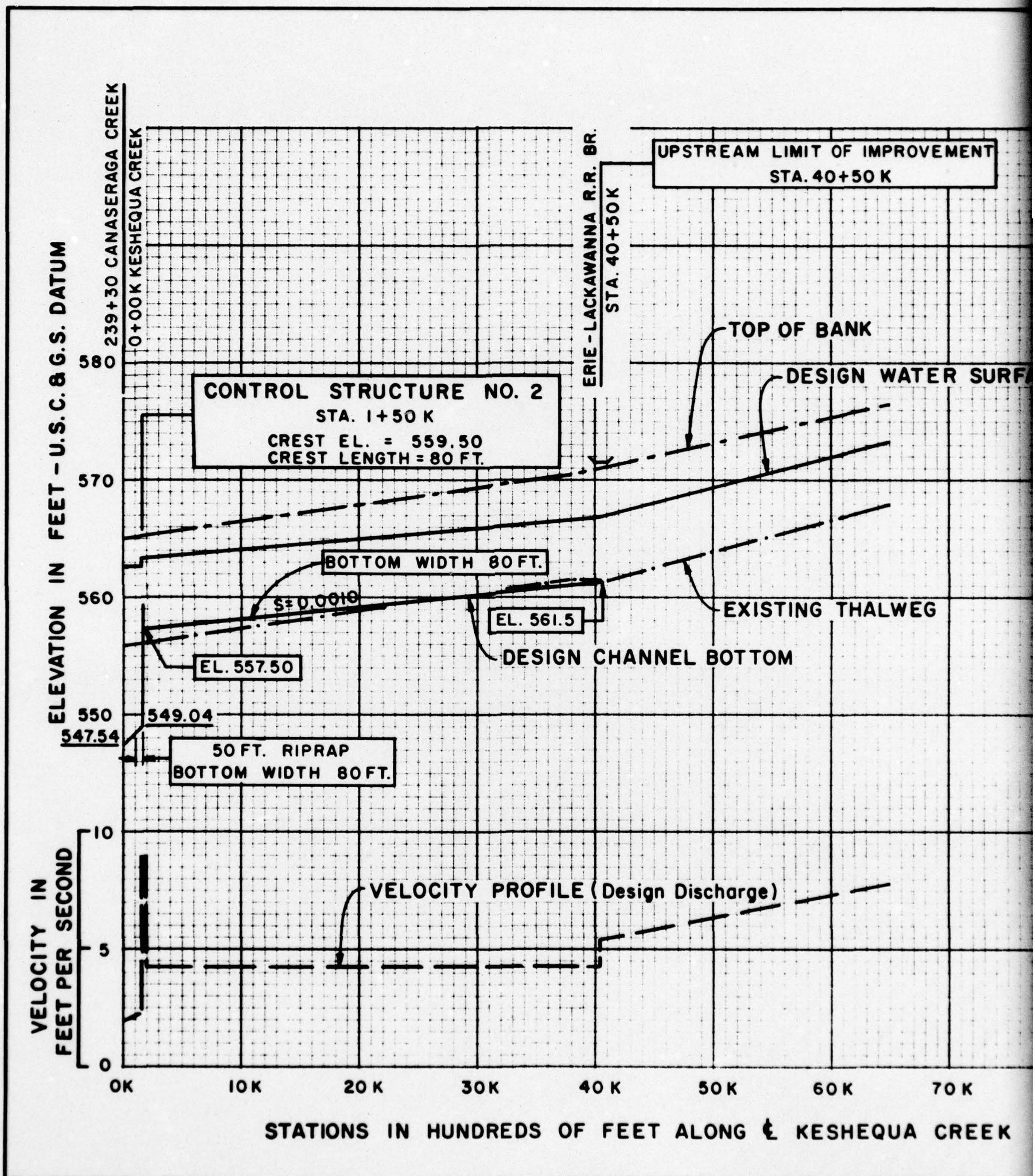
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

LOCAL PROTECTION PROJECT
CANASERAGA CREEK

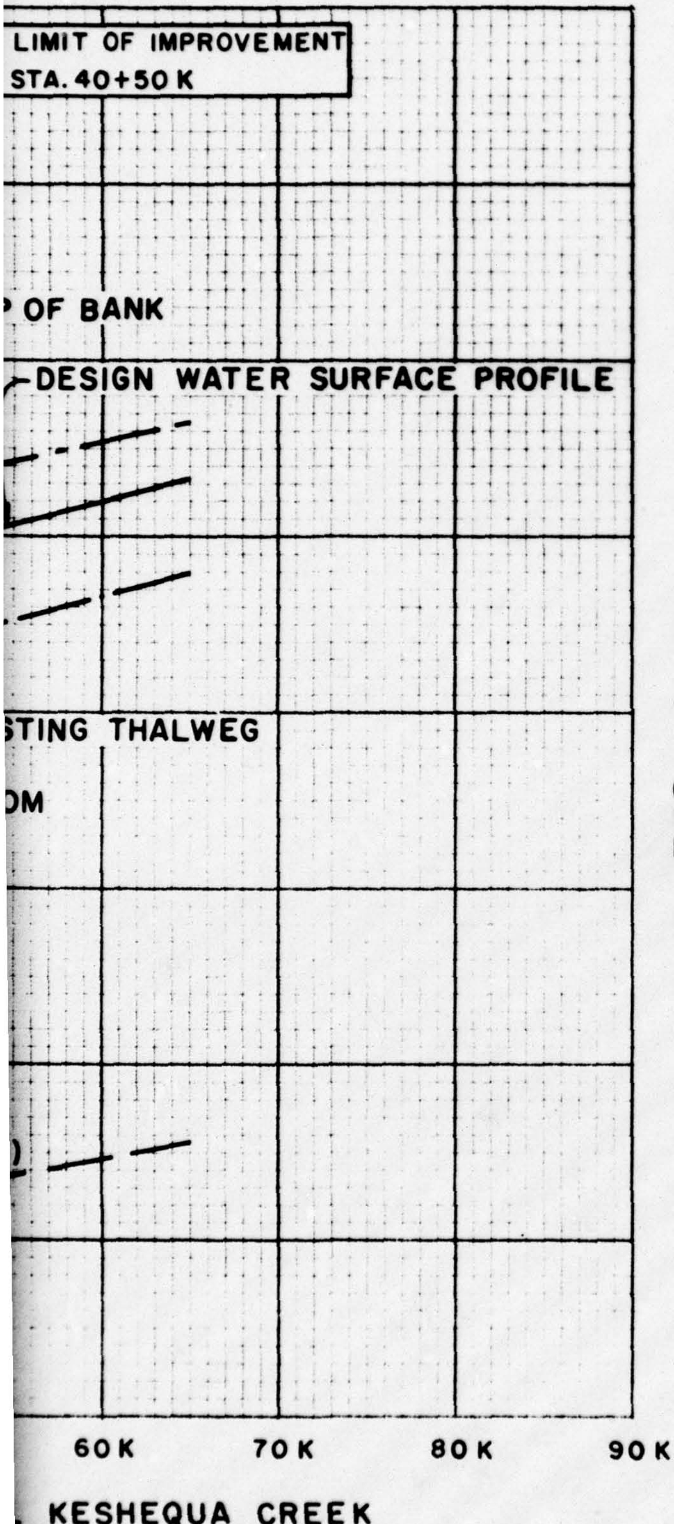
PROFILES 600+00 TO 898+00

U. S. ARMY ENGINEER DISTRICT, BUFFALO

3



239+30 CANASERAGA CREEK
0+00K KESHEQUA CREEK
ERIE-LACKAWANNA R.R. BR.
STA. 40+50 K
UPSTREAM LIMIT OF IMPROVEMENT
STA. 40+50 K
TOP OF BANK
DESIGN WATER SURF
CONTROL STRUCTURE NO. 2
STA. 1+50 K
CREST EL. = 559.50
CREST LENGTH = 80 FT.
BOTTOM WIDTH 80 FT.
S=0.0010
EL. 561.5
EXISTING THALWEG
DESIGN CHANNEL BOTTOM
EL. 557.50
549.04
547.54
50 FT. RIPRAP
BOTTOM WIDTH 80 FT.
ELEVATION IN FEET - U.S.C.&G.S. DATUM
580
570
560
550
VELOCITY IN FEET PER SECOND
10
5
0
VELOCITY PROFILE (Design Discharge)
0K
10K
20K
30K
40K
50K
60K
70K
STATIONS IN HUNDREDS OF FEET ALONG ℄ KESHEQUA CREEK



LEGEND

CONTROL STRUCTURE NO. 2 STA. 1+50 K CREST EL. = 559.50 CREST LENGTH = 80 FT.	INDICATES PROPOSED IMPROVEMENTS.

NOTES

IMPROVED CHANNEL SIDE SLOPES TO BE 1 VERTICAL ON 2 1/2 HORIZONTAL.

DESIGN WATER SURFACE PROFILE ON KESHEQUA CREEK IS BASED ON MAXIMUM 5 YEAR "SUMMER EVENTS" STAGE ON CANASERAGA CREEK AND CORRESPONDING DISCHARGE ON KESHEQUA CREEK.

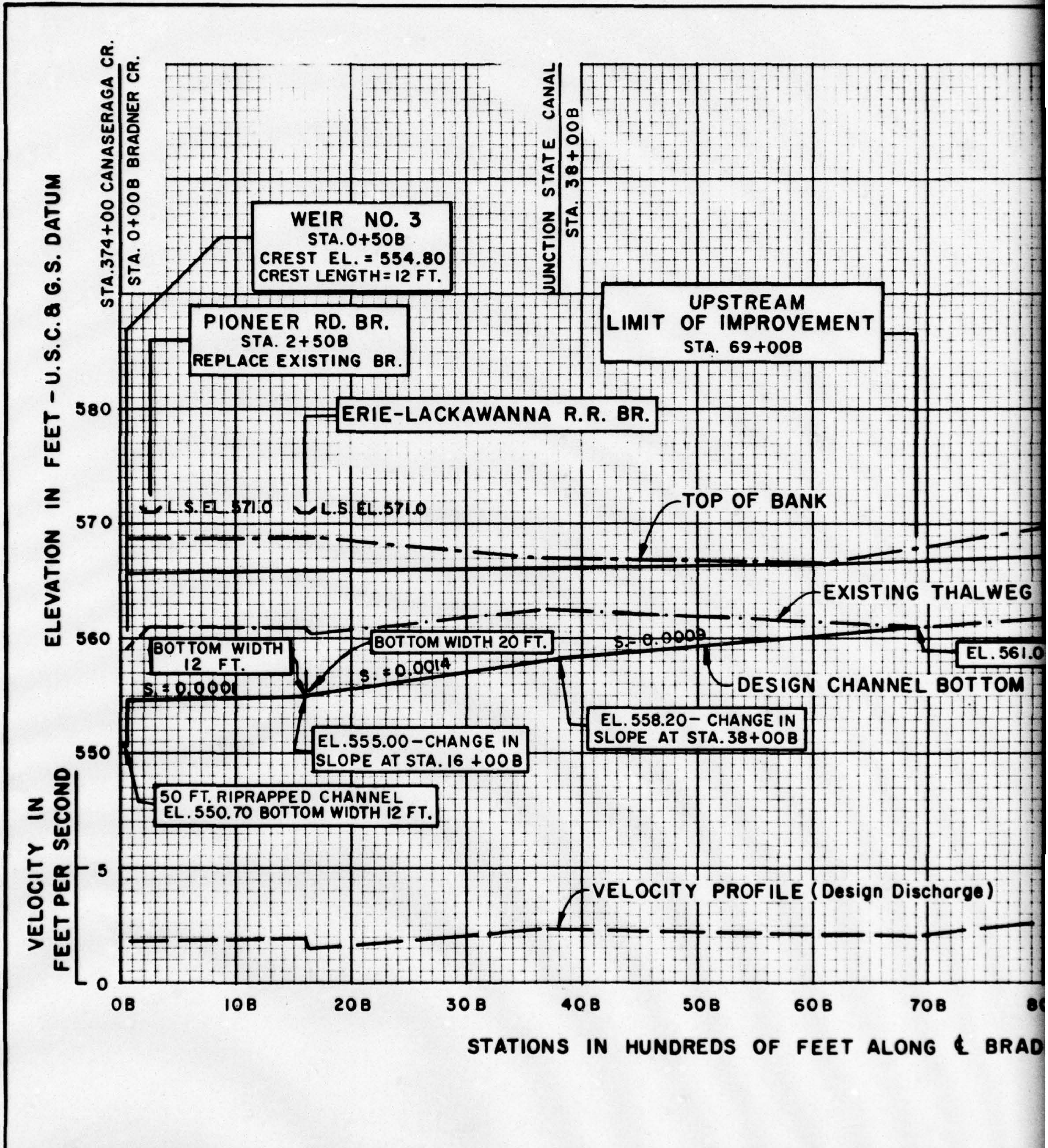
TOP OF BANK DENOTES TOP OF LOW BANK AT THE GIVEN STATION.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

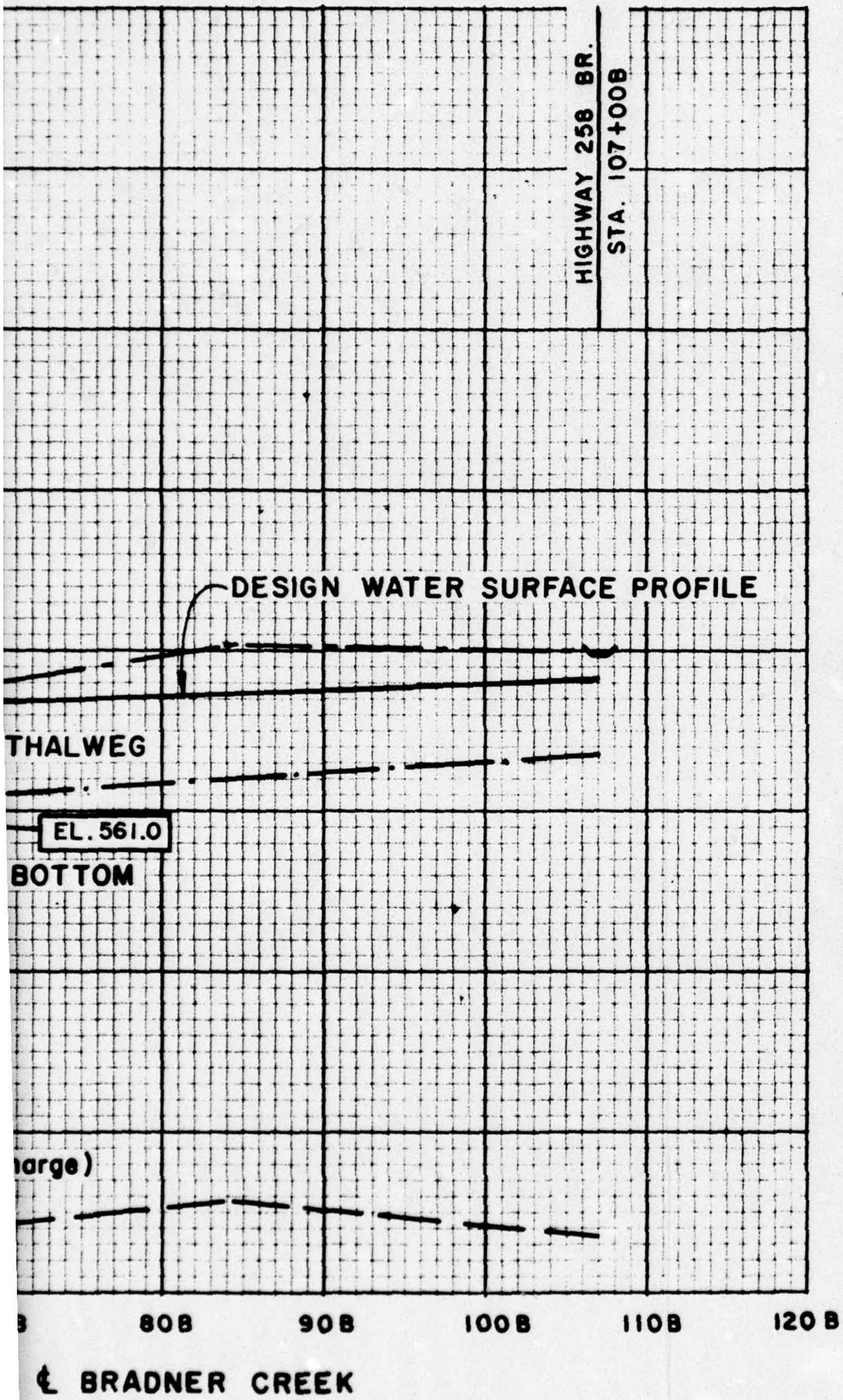
LOCAL PROTECTION PROJECT
CANASERAGA CREEK

KESHEQUA CREEK PROFILE

U. S. ARMY ENGINEER DISTRICT, BUFFALO



STA. 374+00 CANASERAGA CR.
STA. 0+00B BRADNER CR.
JUNCTION STATE CANAL
STA. 38+00B
WEIR NO. 3
STA. 0+50B
CREST EL. = 554.80
CREST LENGTH = 12 FT.
PIONEER RD. BR.
STA. 2+50B
REPLACE EXISTING BR.
UPSTREAM
LIMIT OF IMPROVEMENT
STA. 69+00B
ERIE-LACKAWANNA R.R. BR.
L.S. EL. 571.0
L.S. EL. 571.0
TOP OF BANK
EXISTING THALWEG
BOTTOM WIDTH 12 FT.
BOTTOM WIDTH 20 FT.
S. = 0.0009
S. = 0.0014
S. = 0.0001
EL. 561.0
DESIGN CHANNEL BOTTOM
EL. 558.20 - CHANGE IN SLOPE AT STA. 38+00B
EL. 555.00 - CHANGE IN SLOPE AT STA. 16+00B
50 FT. RIPRAPPED CHANNEL
EL. 550.70 BOTTOM WIDTH 12 FT.
VELOCITY PROFILE (Design Discharge)
ELEVATION IN FEET - U.S.C. & G.S. DATUM
VELOCITY IN FEET PER SECOND
580
570
560
550
5
0
0B
10B
20B
30B
40B
50B
60B
70B
STATIONS IN HUNDREDS OF FEET ALONG ℄ BRAD



LEGEND

WEIR NO. 3
STA. 0+50 B
CREST EL. 554.80
CREST LGT. = 12 FT.

INDICATES PROPOSED IMPROVEMENTS.

NOTES

IMPROVED CHANNEL SIDE SLOPES TO BE 1 VERTICAL ON 2 1/2 HORIZONTAL.

DESIGN WATER SURFACE PROFILE ON BRADNER CREEK IS BASED ON MAXIMUM 5 YEAR "SUMMER EVENTS" STAGE ON CANASERAGA CREEK.

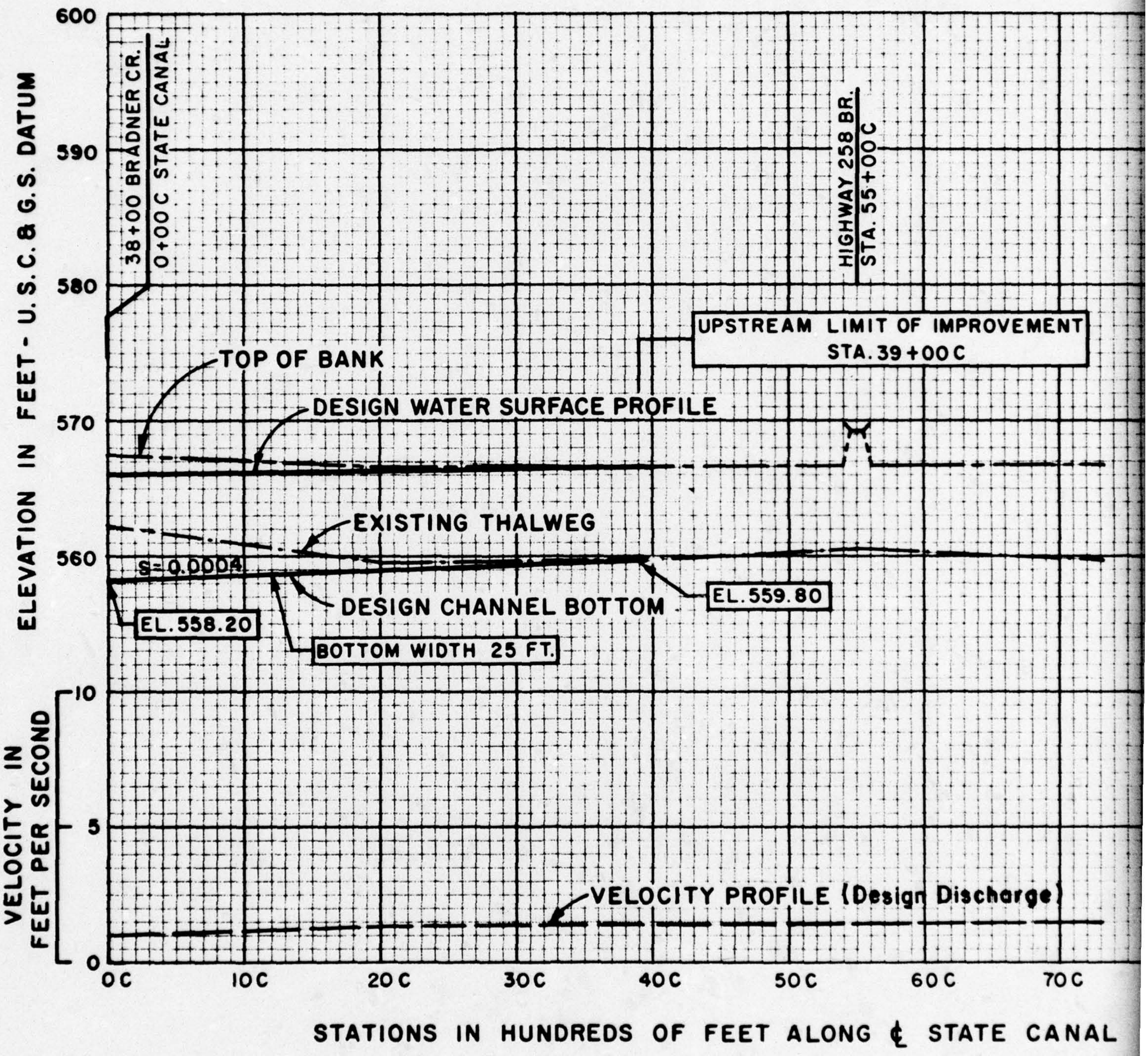
TOP OF BANK DENOTES TOP OF LOW BANK AT THE GIVEN STATION.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
LOCAL PROTECTION PROJECT
CANASERAGA CREEK

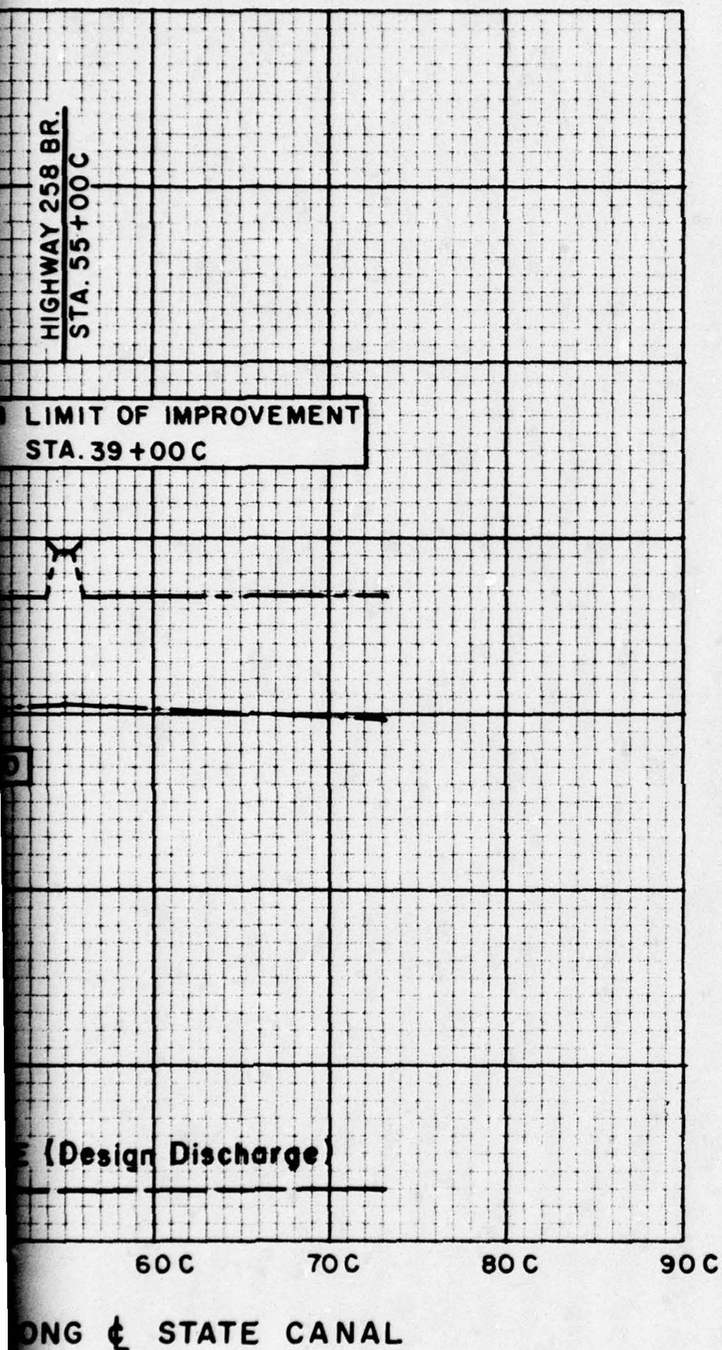
BRADNER CREEK PROFILE

U. S. ARMY ENGINEER DISTRICT, BUFFALO

2



600
590
580
570
560
10
5
0
ELEVATION IN FEET - U.S.C.& G.S. DATUM
VELOCITY IN FEET PER SECOND
38+00 BRADNER CR.
0+00 C STATE CANAL
HIGHWAY 258 BR.
STA. 55+00 C
UPSTREAM LIMIT OF IMPROVEMENT
STA. 39+00 C
TOP OF BANK
DESIGN WATER SURFACE PROFILE
EXISTING THALWEG
S=0.0004
DESIGN CHANNEL BOTTOM
EL. 558.20
EL. 559.80
BOTTOM WIDTH 25 FT.
VELOCITY PROFILE (Design Discharge)
0 C
10 C
20 C
30 C
40 C
50 C
60 C
70 C
STATIONS IN HUNDREDS OF FEET ALONG ℄ STATE CANAL



LEGEND

BOTTOM WIDTH 25 FT. INDICATES PROPOSED IMPROVEMENTS.

NOTES

IMPROVED CHANNEL SIDE SLOPES TO BE 1 VERTICAL ON 2 1/2 HORIZONTAL.

DESIGN WATER SURFACE PROFILE ON STATE CANAL IS BASED ON MAXIMUM 5 YEAR "SUMMER EVENTS" STAGE ON BRADNER CREEK.

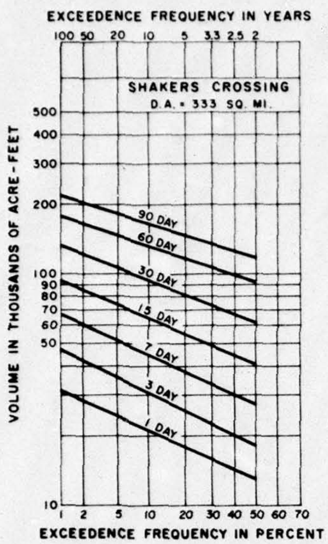
TOP OF BANK DENOTES TOP OF LOW BANK AT THE GIVEN STATION.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA

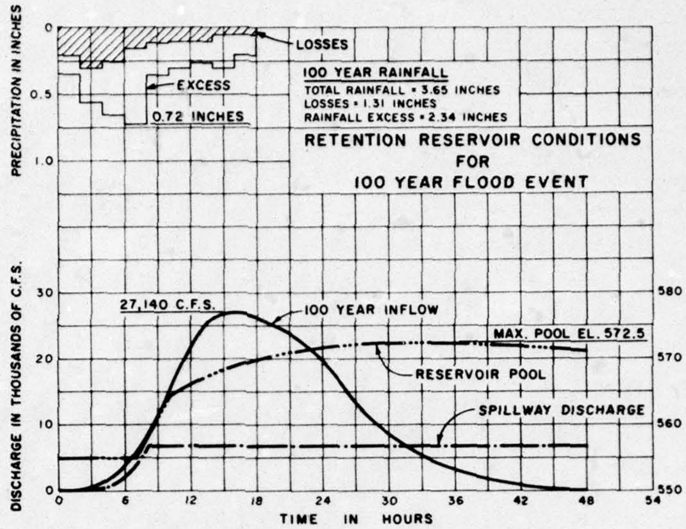
LOCAL PROTECTION PROJECT
CANASERAGA CREEK

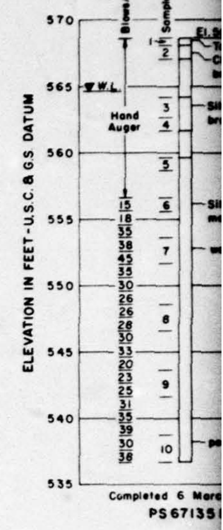
STATE CANAL PROFILE

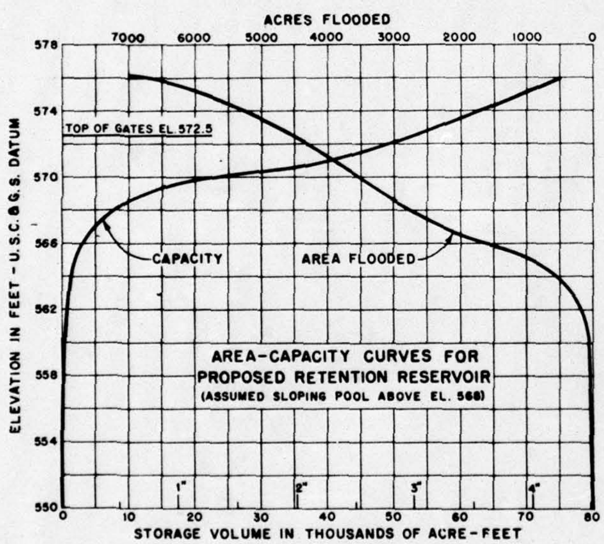
U. S. ARMY ENGINEER DISTRICT, BUFFALO

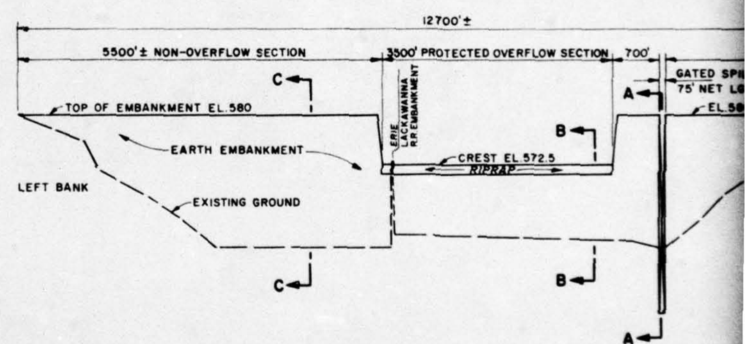


ANNUAL MAXIMUM FLOOD VOLUME FREQUENCY CURVES





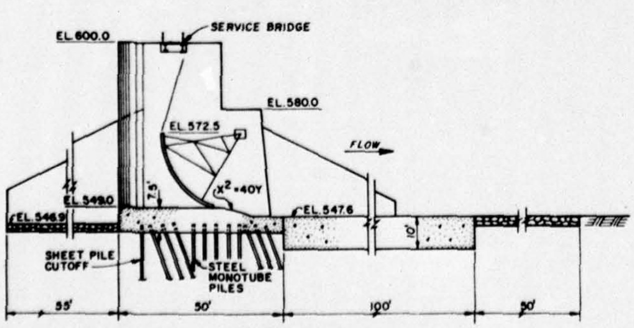




PROFILE ON AXIS OF RETENTION STRUCTURE

SCALE OF FEET (Horizontal)

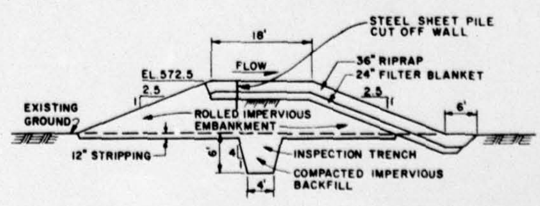
SCALE OF FEET (Vertical)



SECTION A-A

75' SPILLWAY SECTION

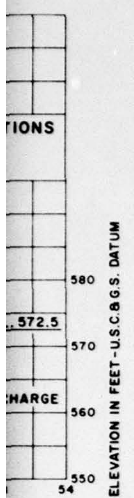
NOT TO SCALE

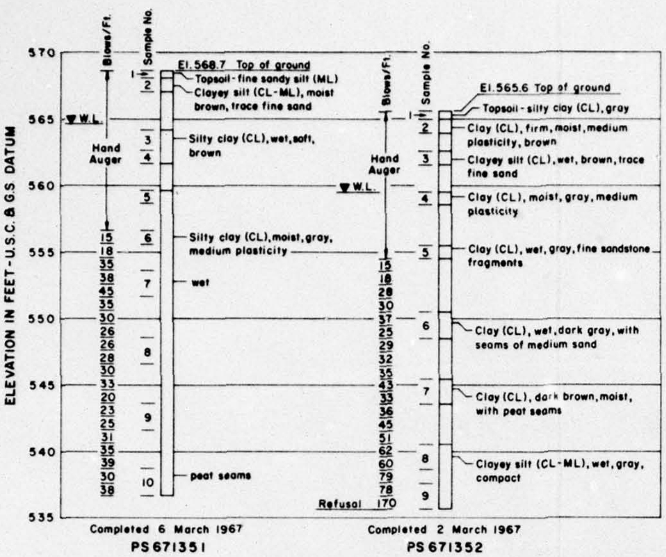


SECTION B-B

3500' OVERFLOW SECTION

NOT TO SCALE





SUBSURFACE EXPLORATIONS-VICINITY OF PROPOSED RETENTION STRUCTURE

LEGEND: (Subsurface Explorations)

▼W.L.	WATER LEVEL IN HOLE AT DATE OF COMPLETION
ML	SILT, INORGANIC, LOW TO NO PLASTICITY
CL	CLAY, INORGANIC, LOW TO MEDIUM PLASTICITY
CL-ML	BORDERLINE BETWEEN SILT AND CLAY

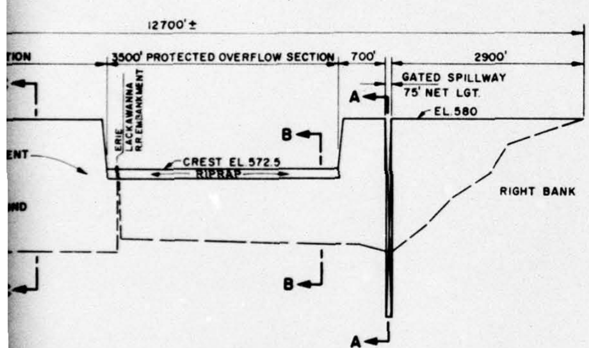
NOTES: (Subsurface Explorations)

APPROXIMATE LOCATIONS OF HOLES ARE SHOWN ON PLATE C2

AUGER SAMPLES WERE OBTAINED WITH A 1 1/2" SPIRAL HAND AUGER.

BLOWS PER FOOT INDICATE THE EFFORT REQUIRED TO ADVANCE A 1 INCH PORTER SAMPLER BY MEANS OF A 25 LB. WEIGHT DROPPED 18" (APPROX.) AND MANUALLY OPERATED.

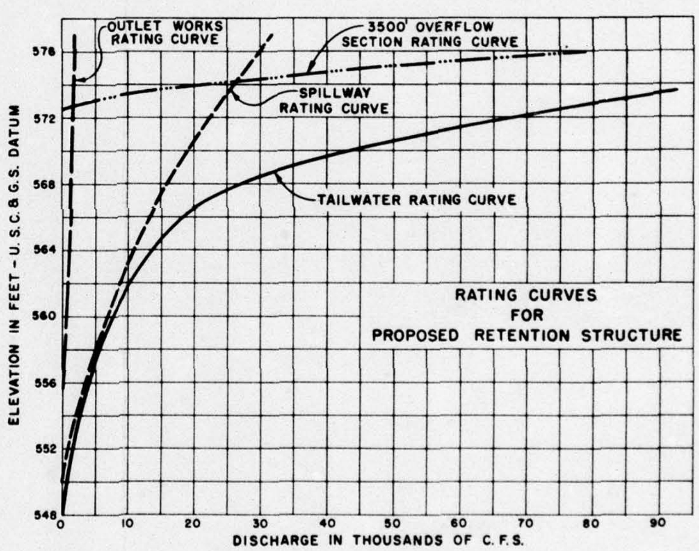
SOIL DESCRIPTIONS ARE BASED ON VISUAL AND MANUAL EXAMINATION OF SAMPLES.

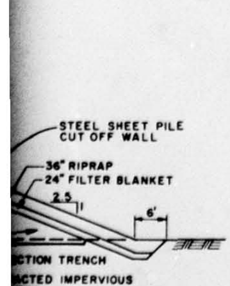


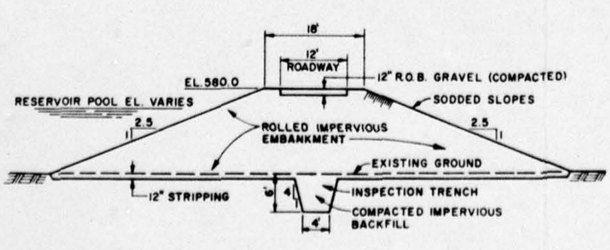
ILE ON AXIS OF RETENTION STRUCTURE

SCALE OF FEET (Horizontal)
1000 0 1000 2000

SCALE OF FEET (Vertical)
10 0 10 20







SECTION C-C
NON-OVERFLOW SECTION
NOT TO SCALE

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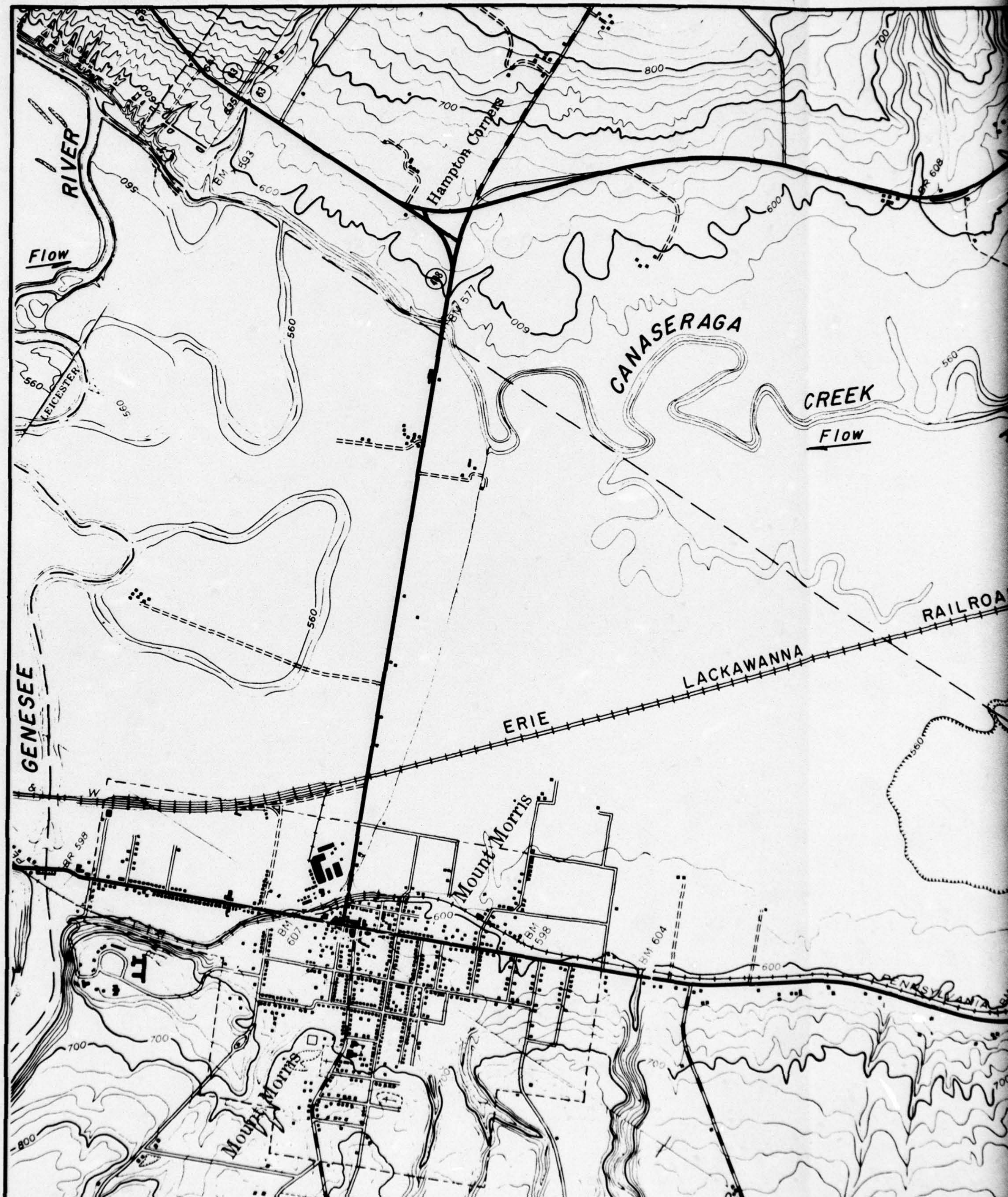
LOCAL PROTECTION PROJECT
CANASERAGA CREEK
LIVINGSTON COUNTY, NEW YORK

DETAILS-PROPOSED RETENTION STRUCTURE

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

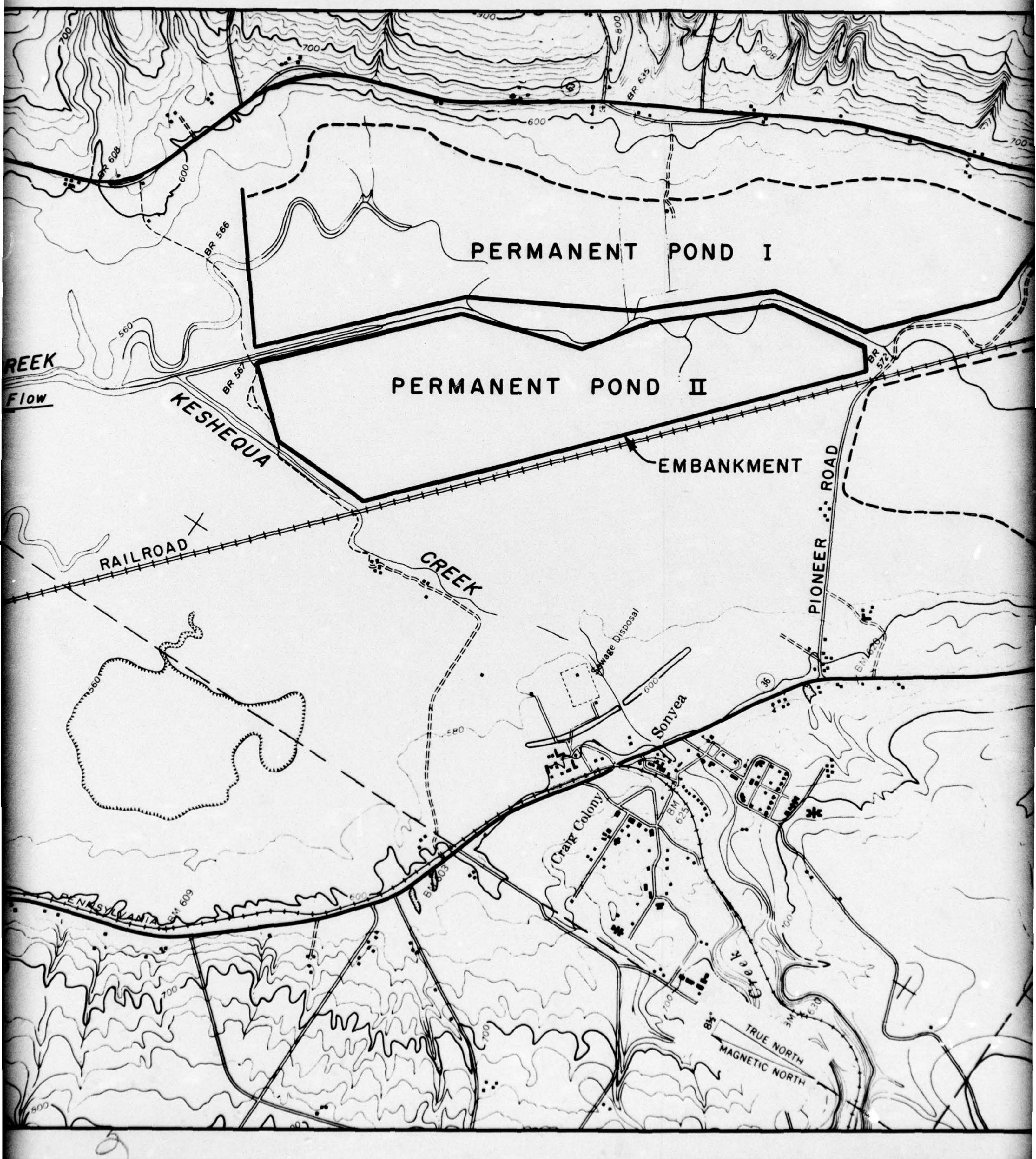
2

PLATE C9

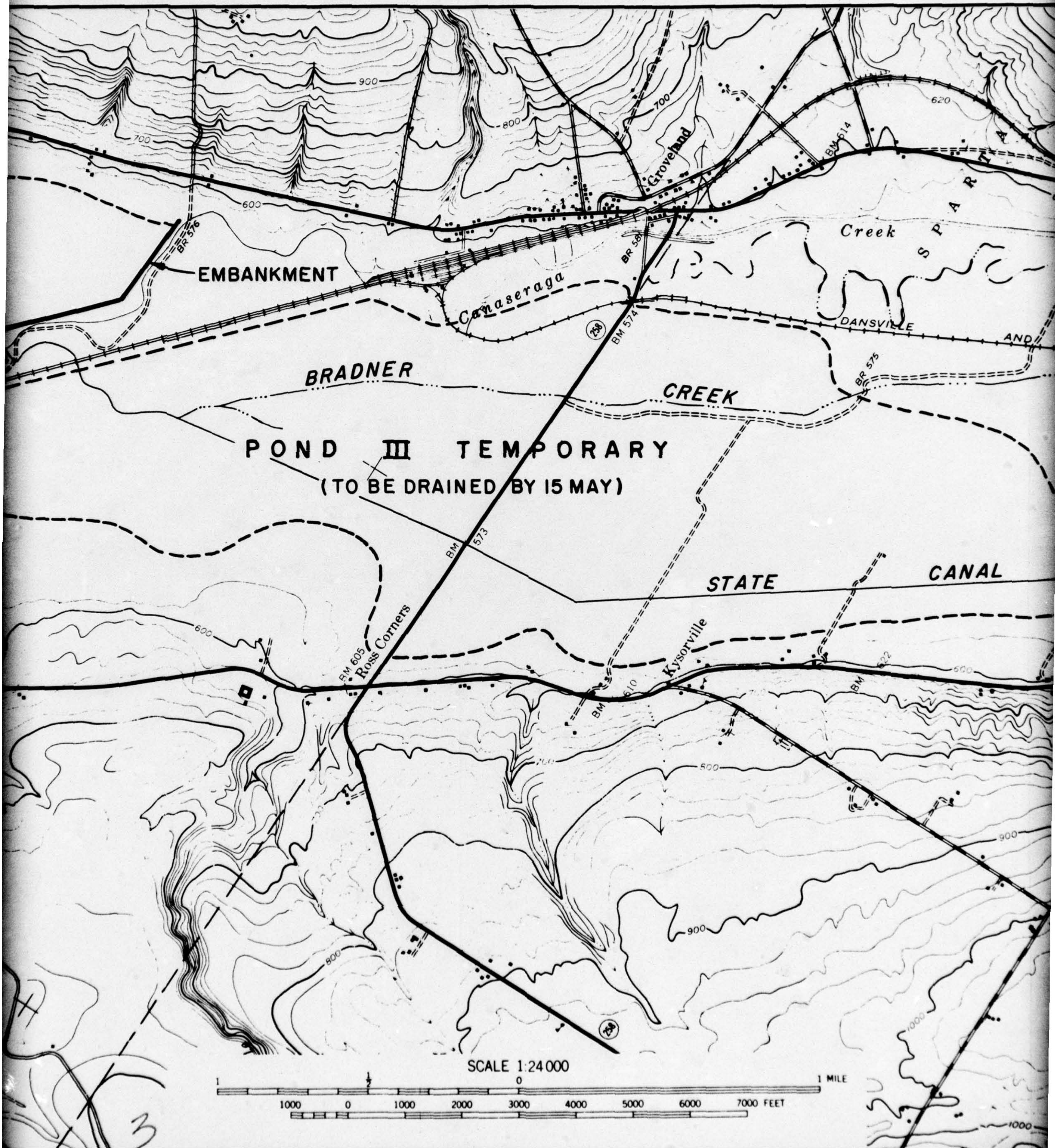


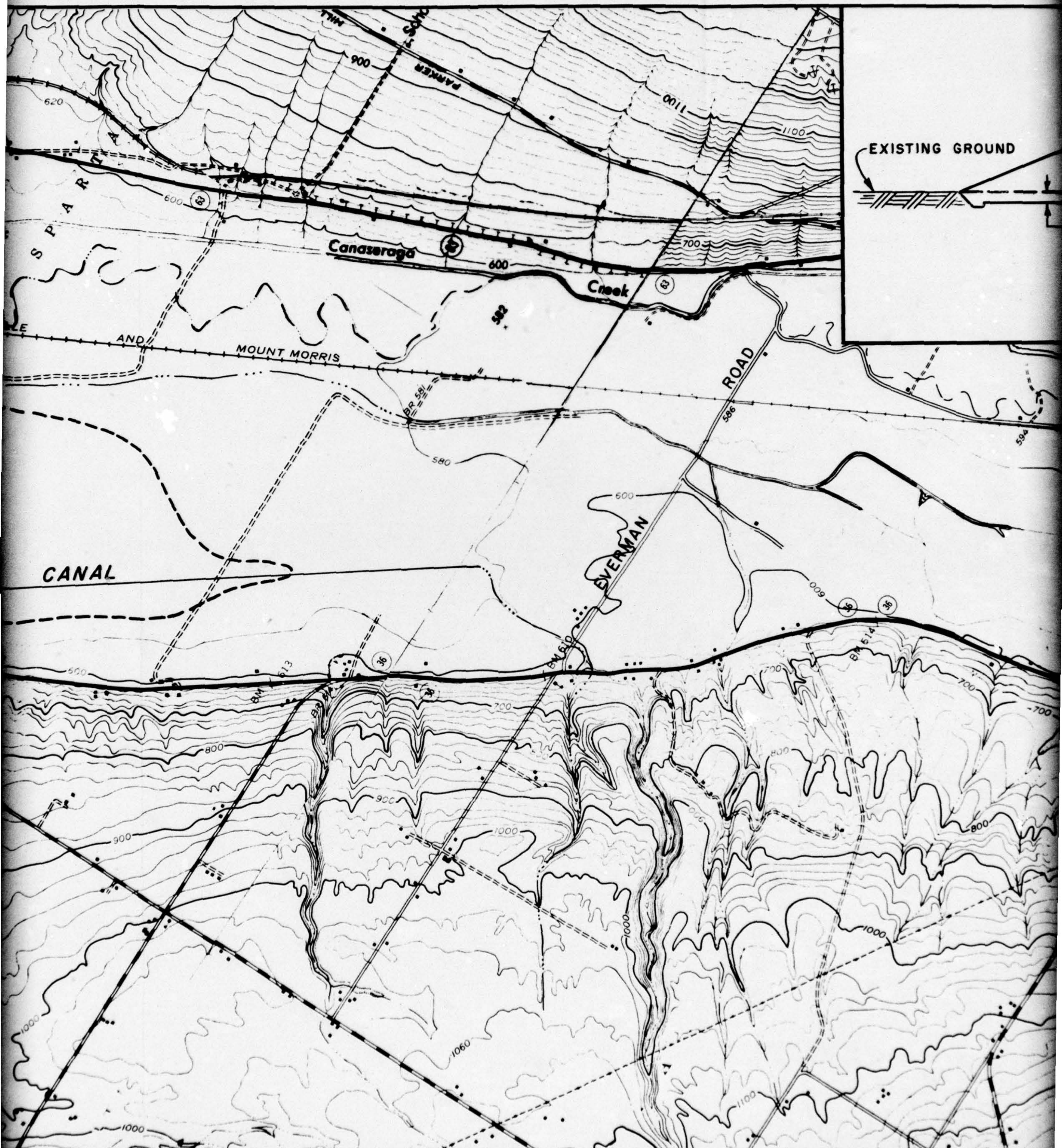
GENESEE
RIVER
Flow
LEICESTER
Hampton Corners
CANASERAGA
CREEK
Flow
ERIE
LACKAWANNA
RAILROAD
Mount Morris
Mount Morris
PENNSYLVANIA
BM 593
BM 577
BM 607
BM 598
BM 604
BR 598
BR 608
CEM
560
600
700
800

1



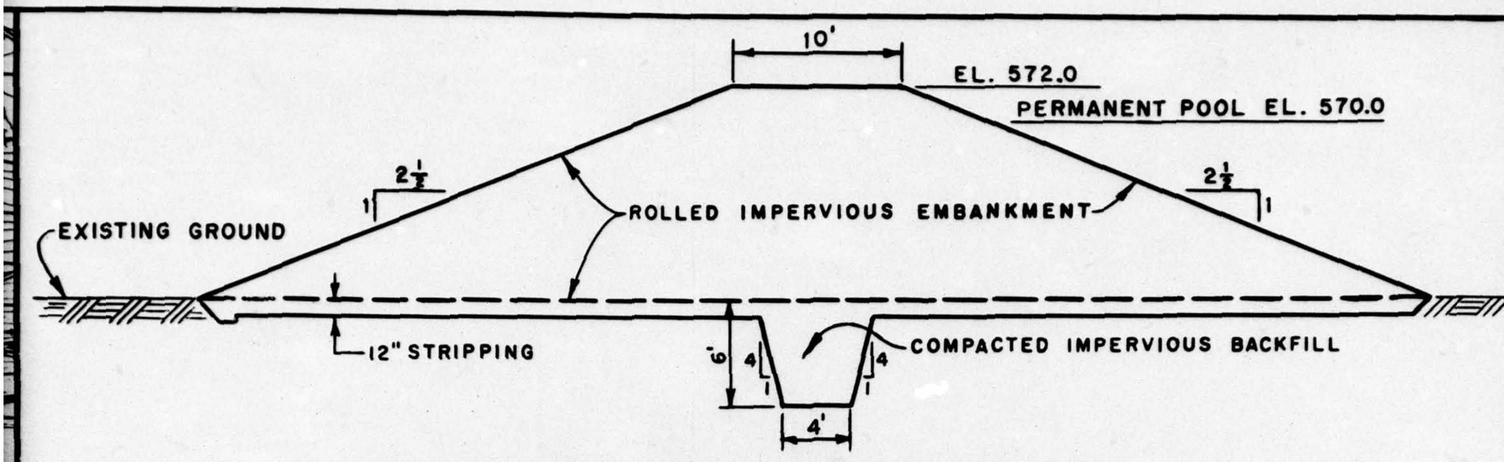
PERMANENT POND I
PERMANENT POND II
EMBANKMENT
KESHEQUA
CREEK
REEK
Flow
RAILROAD
PIONEER ROAD
Sewage Disposal
Sonyea
Craig Colony
TRUE NORTH
MAGNETIC NORTH
BR 608
BR 566
BR 567
BR 572
BR 635
BM 625
BM 609
BM 603
PENNSYLVANIA


EMBANKMENT
Groveland
Canaseraga
Creek
DANSVILLE
AND
BRADNER
CREEK
POND III TEMPORARY
(TO BE DRAINED BY 15 MAY)
STATE
CANAL
Ross Corners
Kysorville
SCALE 1:24000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
3

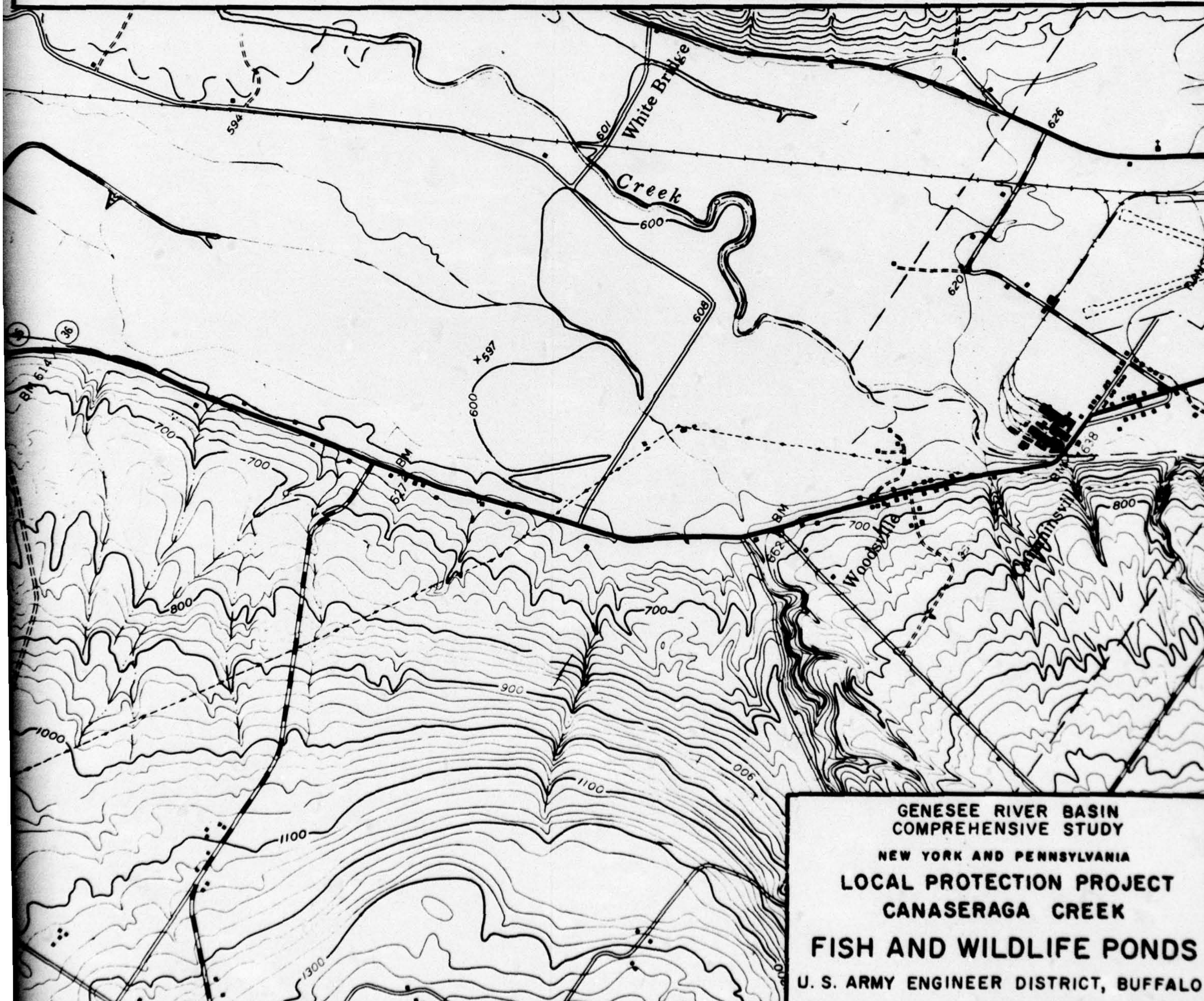


EXISTING GROUND
SPARTA
Canaseraga
Creek
AND
MOUNT MORRIS
ROAD
EVERMAN
CANAL
PARKER
MILL
SCHO
BR 581
BM 613
BM 610
BM 614
620
600
900
1100
700
582
580
586
594
800
1000
1060

4



TYPICAL EMBANKMENT SECTION



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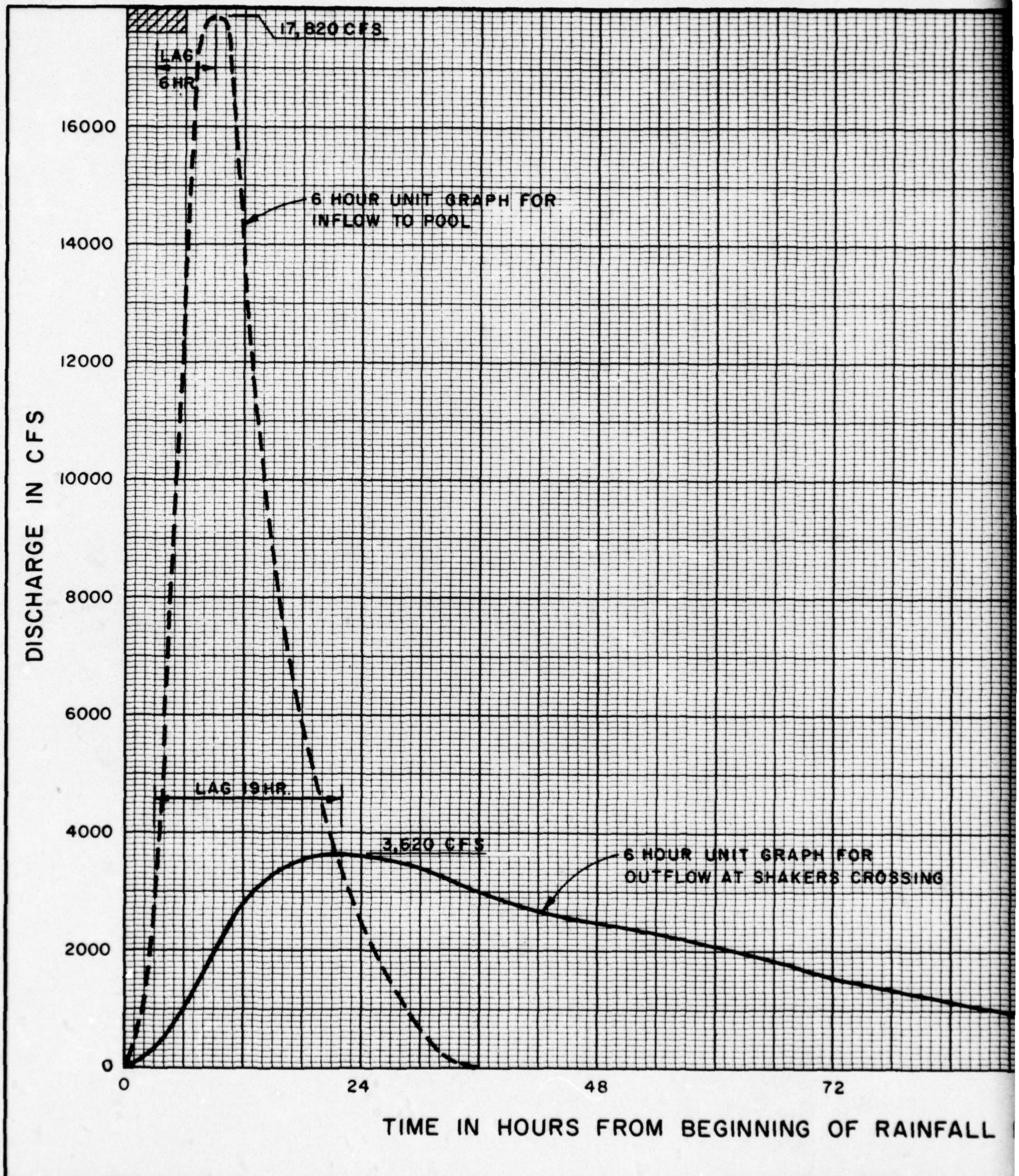
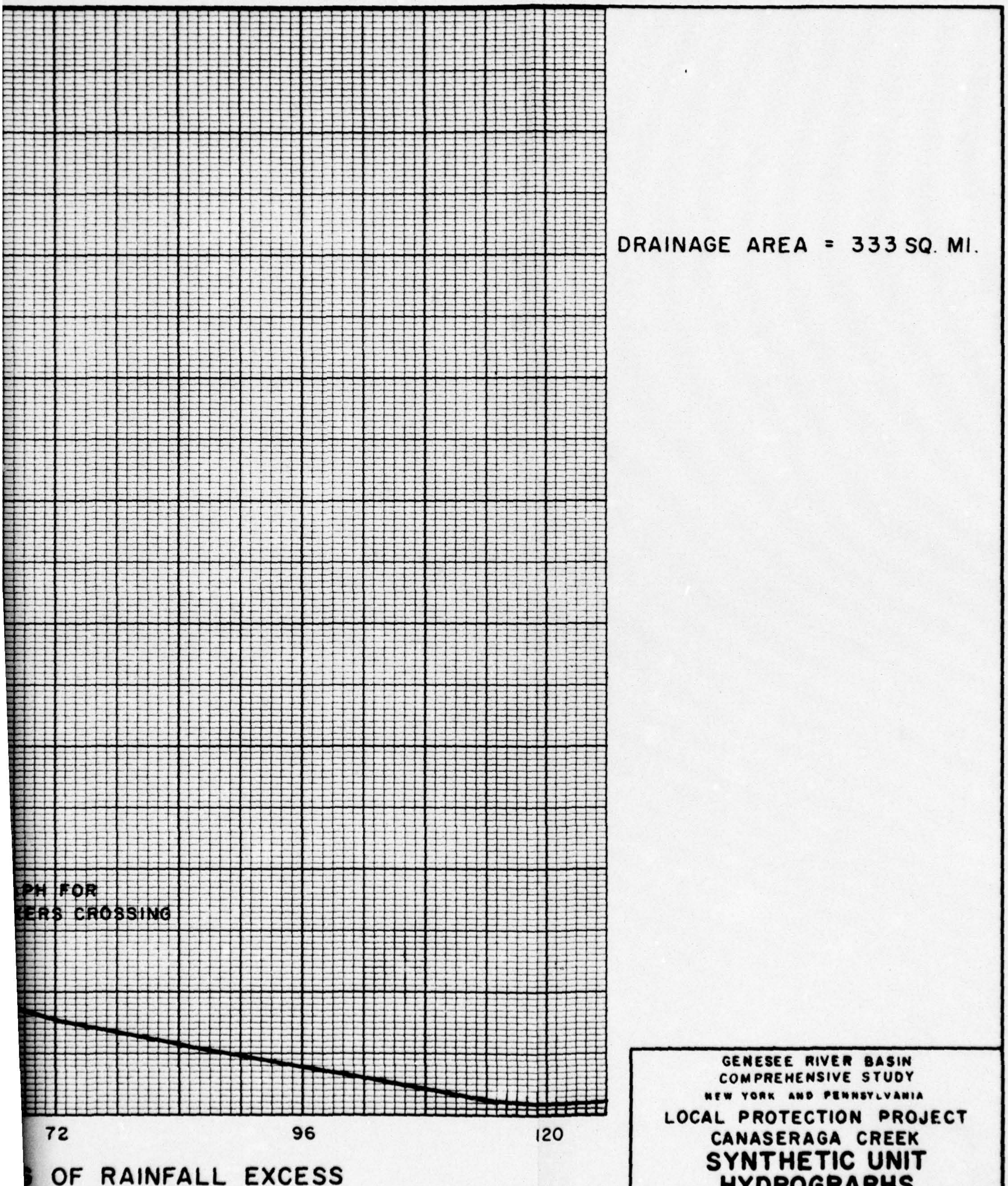
NEW YORK AND PENNSYLVANIA

LOCAL PROTECTION PROJECT
CANASERAGA CREEK

FISH AND WILDLIFE PONDS

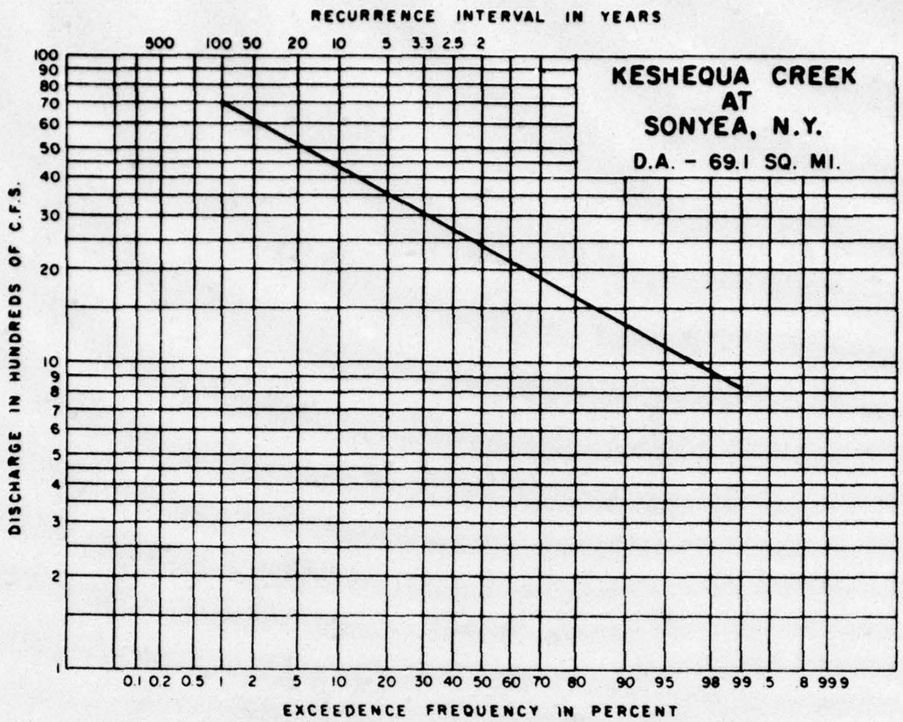
U. S. ARMY ENGINEER DISTRICT, BUFFALO

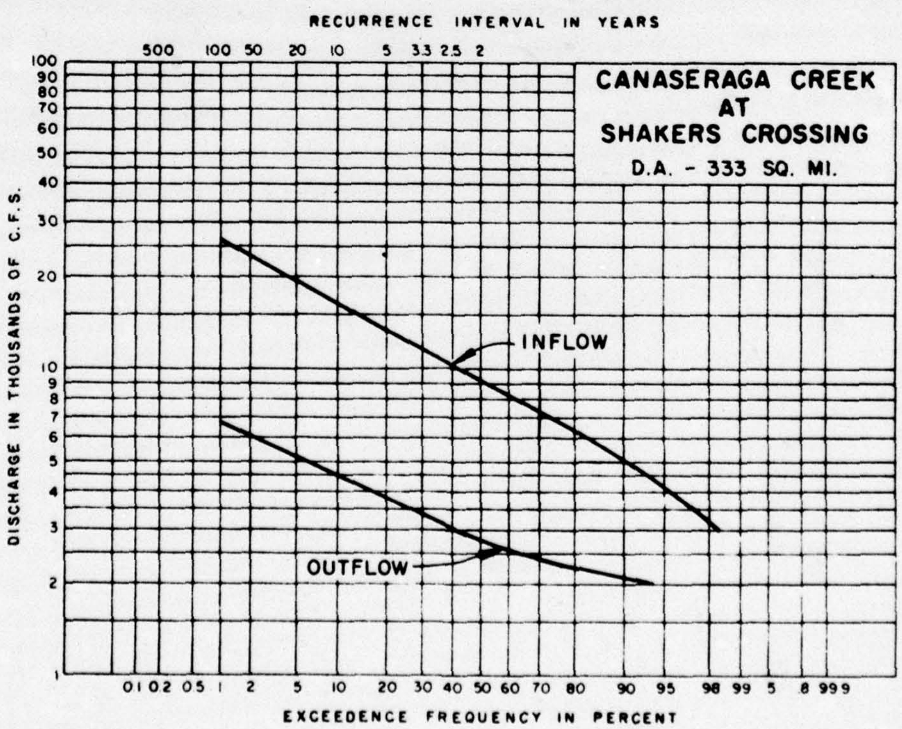

17,820 CFS
LAG 6 HR.
6 HOUR UNIT GRAPH FOR INFLOW TO POOL
LAG 19 HR.
3,620 CFS
6 HOUR UNIT GRAPH FOR OUTFLOW AT SHAKERS CROSSING
DISCHARGE IN CFS
16000
14000
12000
10000
8000
6000
4000
2000
0
0
24
48
72
TIME IN HOURS FROM BEGINNING OF RAINFALL

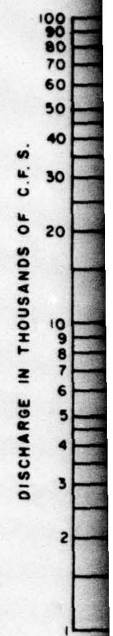


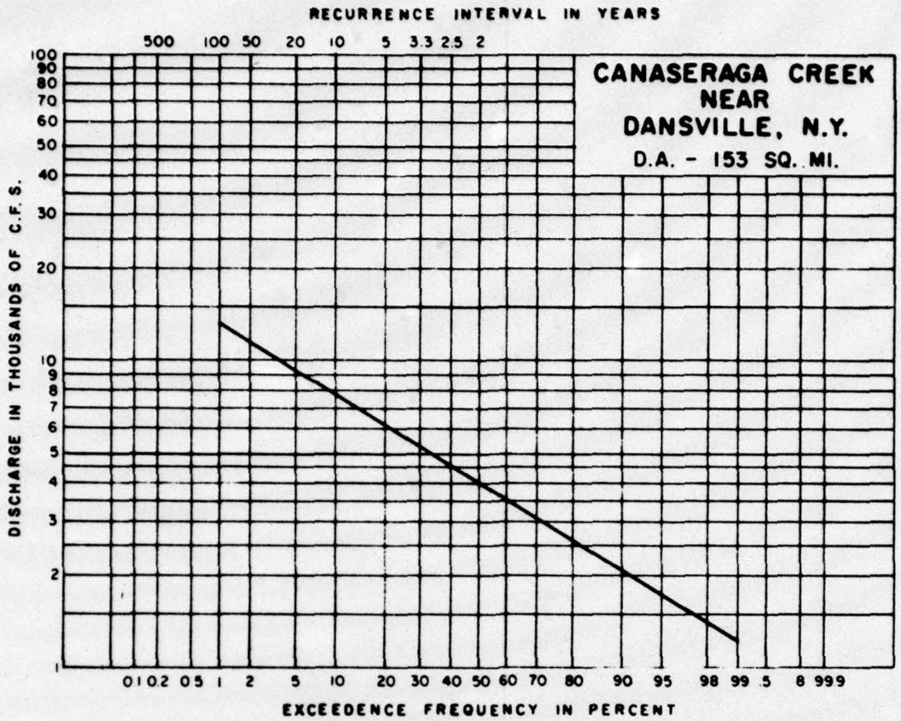
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
LOCAL PROTECTION PROJECT
CANASERAGA CREEK
SYNTHETIC UNIT HYDROGRAPHS
U.S. ARMY ENGINEER DISTRICT, BUFFALO

2

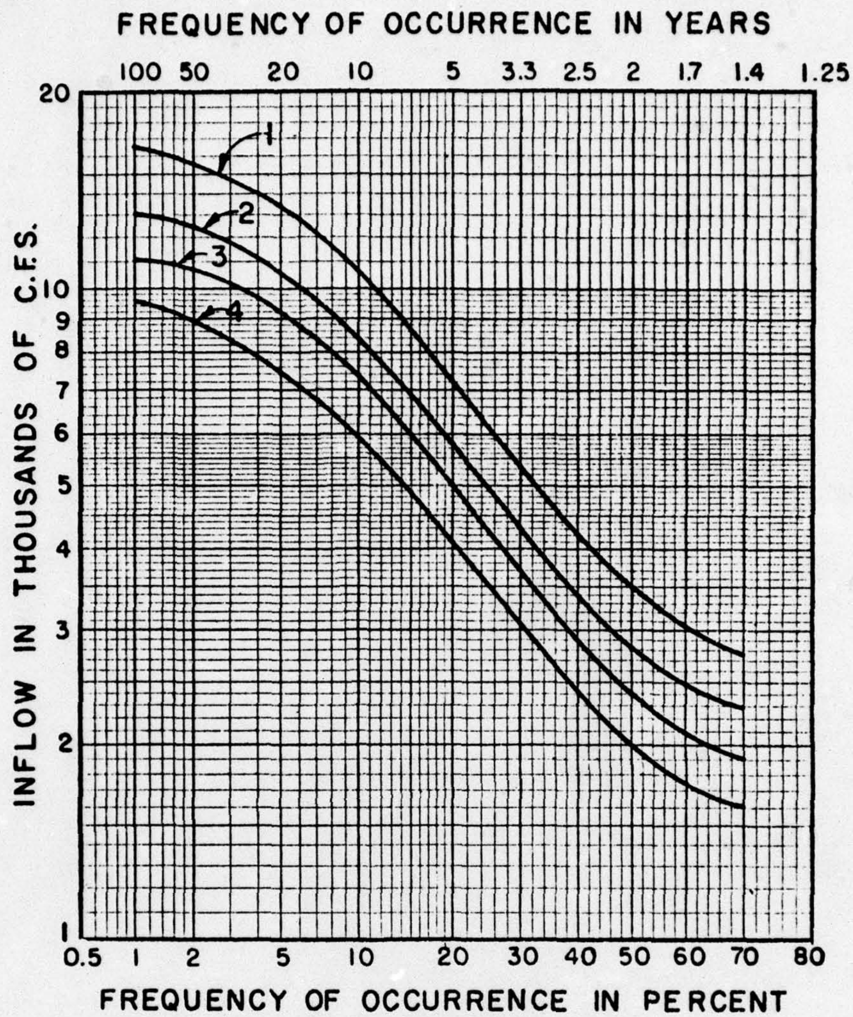

RECURRENCE INTERVAL IN YEARS
500 100 50 20 10 5 3.3 2.5 2
KESHEQUA CREEK
AT
SONYEA, N.Y.
D.A. - 69.1 SQ. MI.
DISCHARGE IN HUNDREDS OF C.F.S.
100 90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 2 1
0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 5 8 999
EXCEEDENCE FREQUENCY IN PERCENT


RECURRENCE INTERVAL IN YEARS
500 100 50 20 10 5 3.3 2.5 2
CANASERAGA CREEK
AT
SHAKERS CROSSING
D.A. - 333 SQ. MI.
INFLOW
OUTFLOW
DISCHARGE IN THOUSANDS OF C.F.S.
100 90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 2 1
0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 5 8 999
EXCEEDENCE FREQUENCY IN PERCENT


DISCHARGE IN THOUSANDS OF C.F.S.
100 90 80 70 60 50 40 30 20 10 9 8 7 6 5 4 3 2 1



GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
LOCAL PROTECTION PROJECT
CANASERAGA CREEK
ANNUAL EVENTS
DISCHARGE FREQUENCY CURVES
U. S. ARMY ENGINEER DISTRICT, BUFFALO

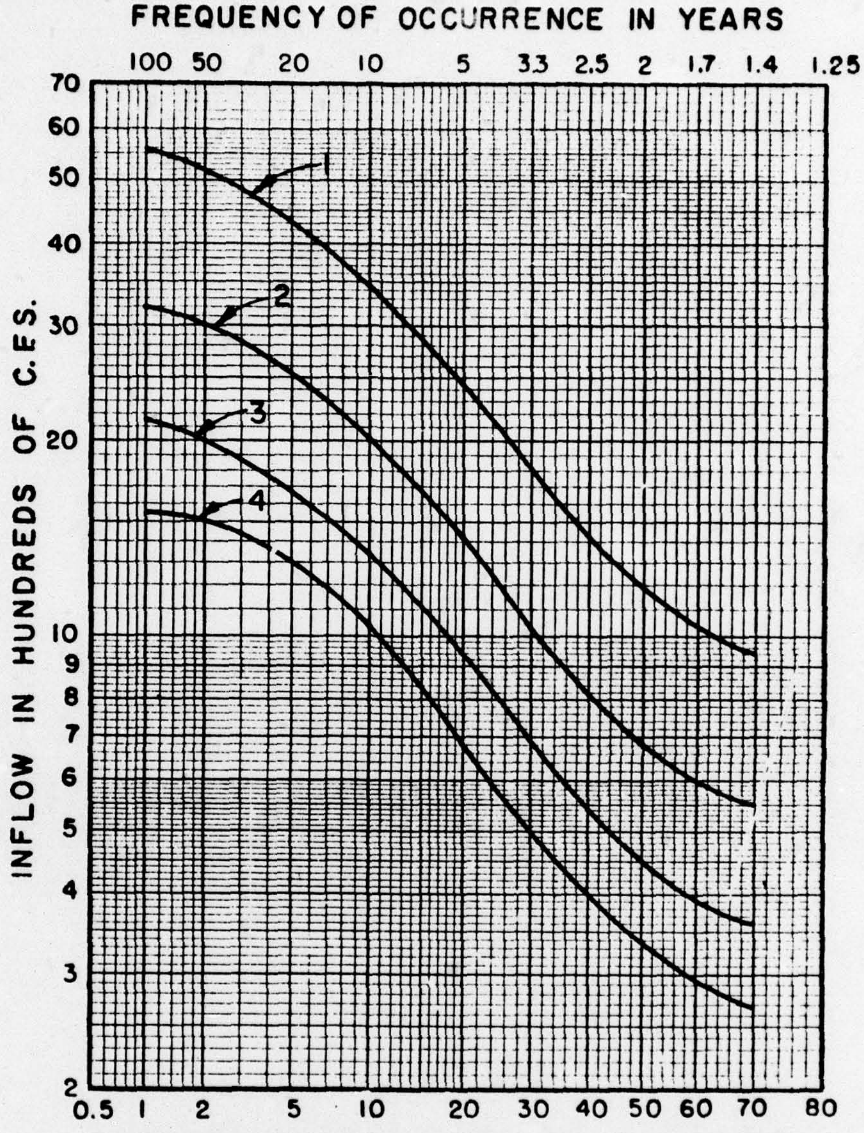


CANASERAGA CREEK

$$Q_{Sub\text{-}Area} = Q_{Dansville} \left(\frac{D.A._{Sub\text{-}Area}}{D.A._{Dansville}} \right)^{0.77}$$

1. CANASERAGA CREEK AT SHAKERS CROSSING DRAINAGE AREA = 333 SQ. MI.
2. CANASERAGA CREEK UPSTREAM OF KESHEQUA CREEK DRAINAGE AREA = 239 SQ. MI.
3. CANASERAGA CREEK UPSTREAM OF BRADNER CREEK DRAINAGE AREA = 192 SQ. MI.
4. CANASERAGA CREEK AT DANSVILLE DRAINAGE AREA = 153 SQ. MI.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
LOCAL PROTECTION PROJECT
CANASERAGA CREEK
SUMMER EVENTS
DISCHARGE-FREQUENCY CURVES
U. S. ARMY ENGINEER DISTRICT, BUFFALO

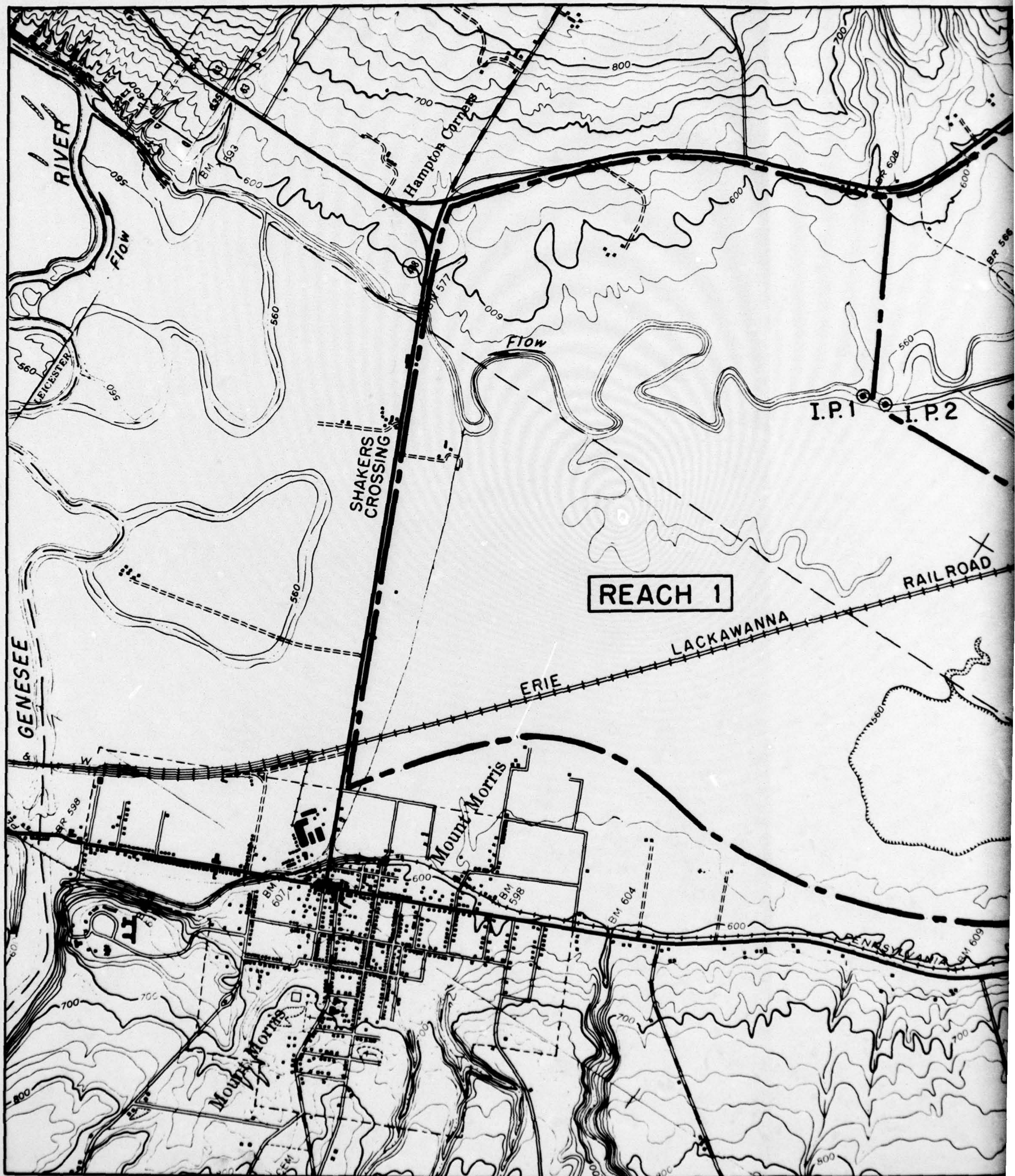


TRIBUTARY STREAMS

$$Q_{Tributary} = Q_{Dansville} \left(\frac{D.A._{Tributary}}{D.A._{Dansville}} \right)^{0.77}$$

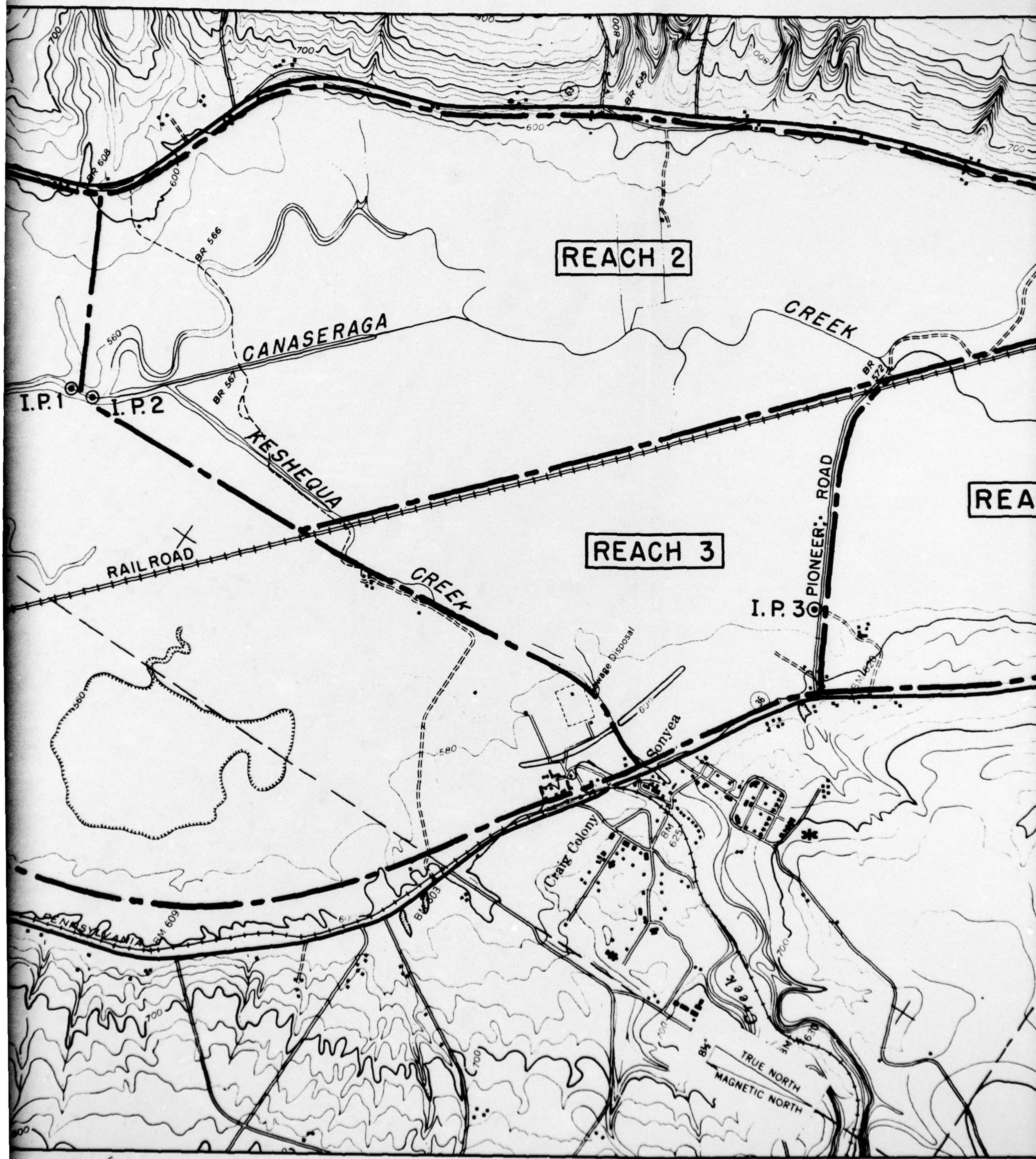
1. KESHEQUA CREEK
   DRAINAGE AREA = 76 SQ. MI.
2. BRADNER CREEK AT MOUTH
   DRAINAGE AREA = 37 SQ. MI.
3. STATE CANAL
   DRAINAGE AREA = 22 SQ. MI.
4. BRADNER CREEK UPSTREAM OF STATE
   CANAL DRAINAGE AREA = 15 SQ. MI.

GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
LOCAL PROTECTION PROJECT
CANASERAGA CREEK
SUMMER EVENTS
DISCHARGE-FREQUENCY CURVES
U. S. ARMY ENGINEER DISTRICT, BUFFALO

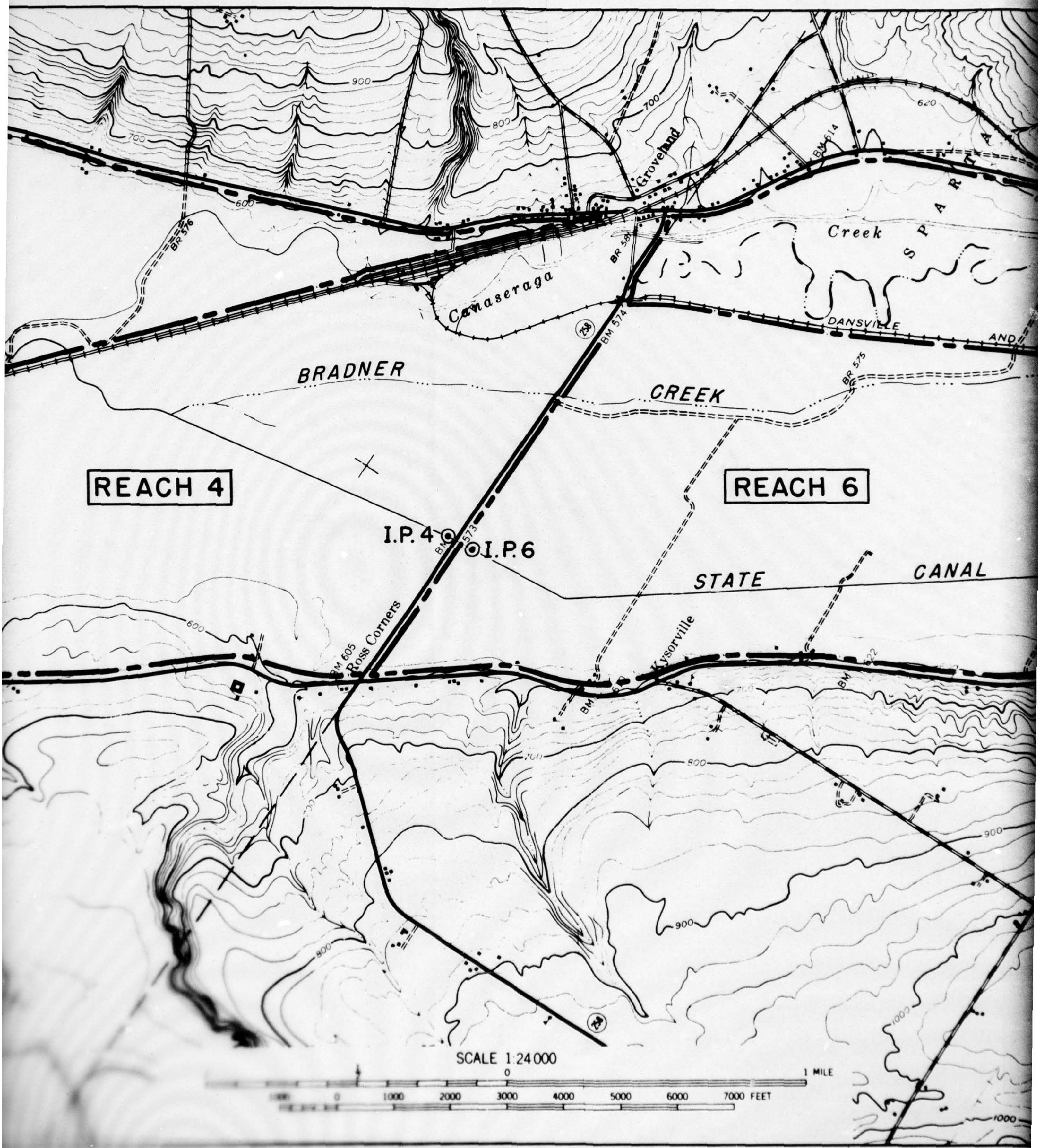


REACH 1
GENESEE RIVER
Flow
Hampton Corners
SHAKERS CROSSING
Mount Morris
ERIE LACKAWANNA RAILROAD
I.P. 1
I.P. 2
LEICESTER
BM 593
BM 607
BM 598
BM 604
BM 609
BR 598
BR 608
BR 566
800
700
600
560

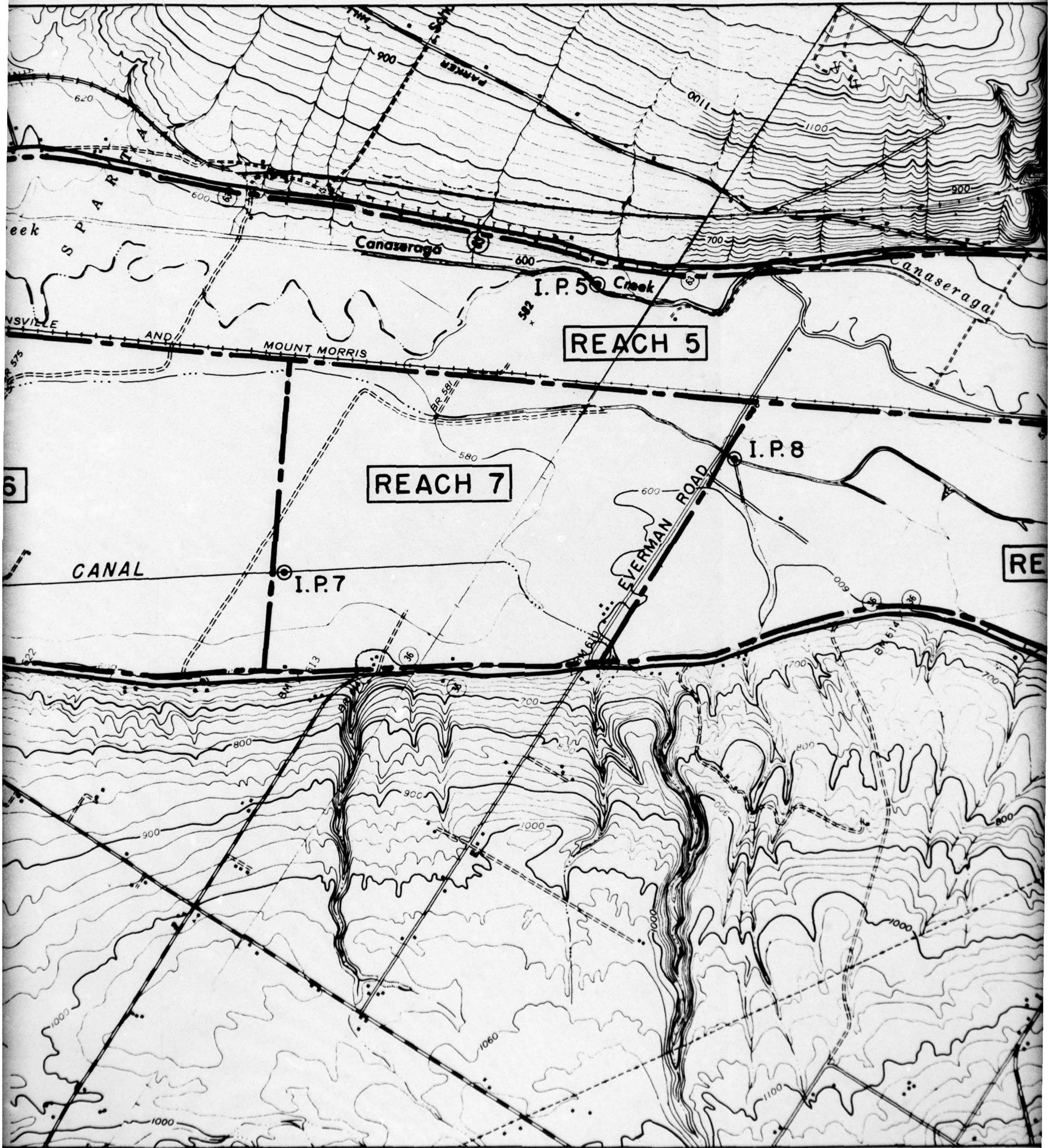
1


REACH 2
REACH 3
REAC
CANASERAGA
CREEK
KESHEQUA
CREEK
RAILROAD
PIONEER ROAD
I.P.1
I.P.2
I.P.3
BR 608
BR 566
BR 567
BR 572
BR 635
Sonyea
Craig Colony
Sewage Disposal
PENNSYLVANIA
BM 609
BM 625
TRUE NORTH
MAGNETIC NORTH
Creek

2

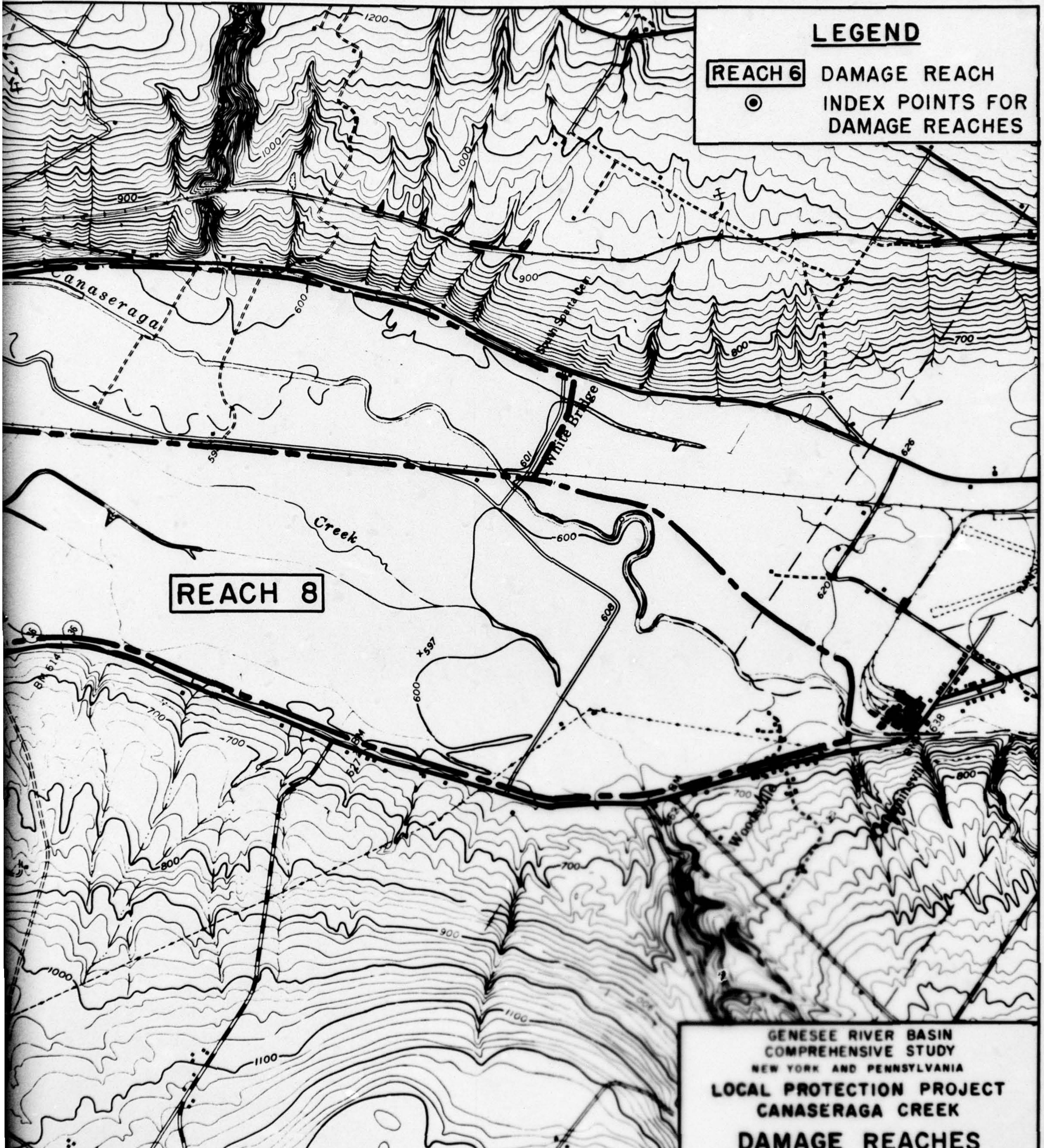


REACH 4
REACH 6
I.P. 4
I.P. 6
BRADNER
CREEK
STATE
CANAL
Canaseraga
Creek
Groveland
Ross Corners
Kysorville
DANSVILLE
AND
SPARTA
BR 576
BR 575
BM 574
BM 573
BM 605
BM 614
900
800
700
600
620
1000
SCALE 1:24 000
0
1 MILE
1000
2000
3000
4000
5000
6000
7000 FEET



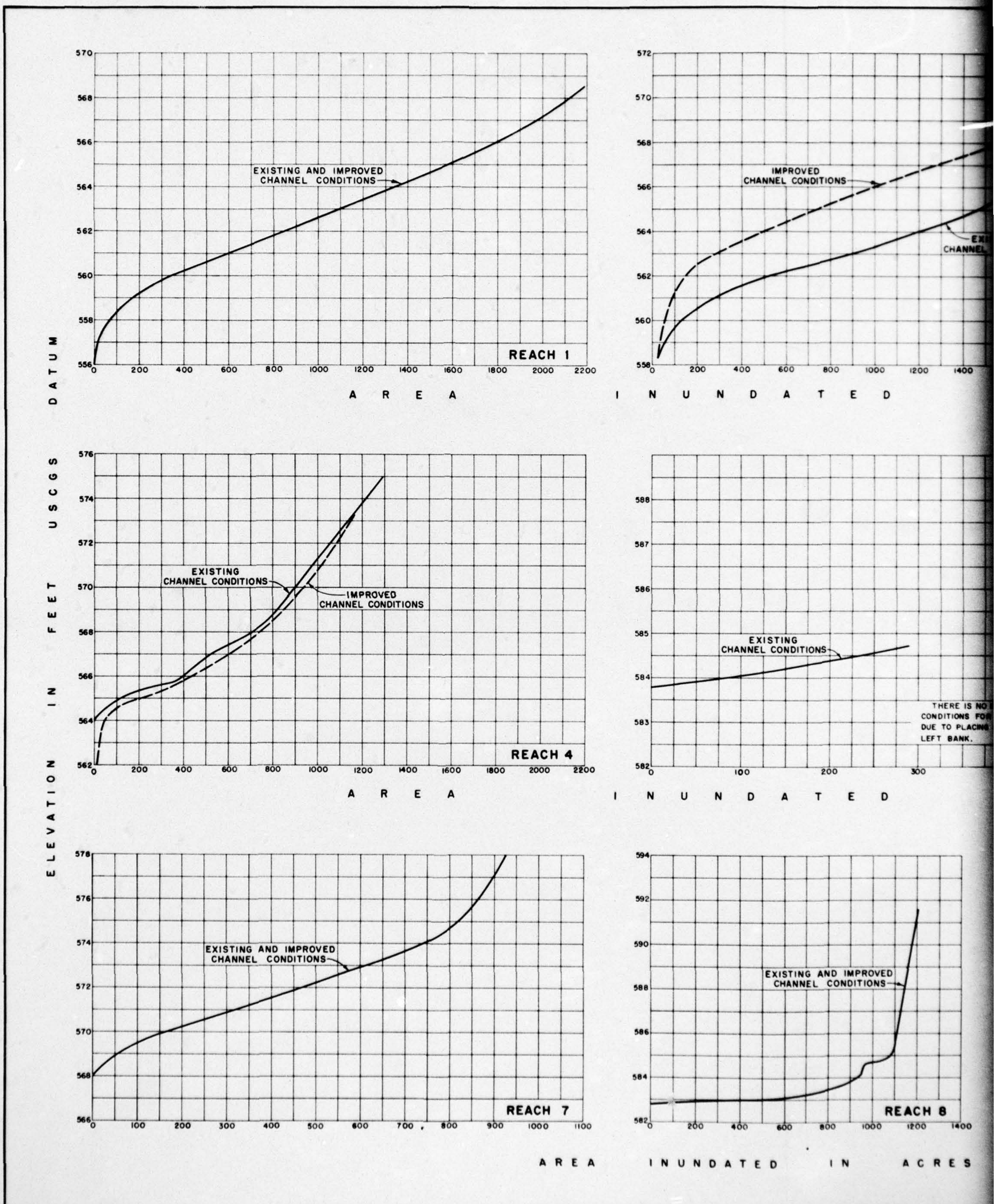
REACH 5
REACH 7
I.P. 5
I.P. 7
I.P. 8
Canaseraga
Creek
Canaseraga
CANAL
EVERMAN ROAD
MOUNT MORRIS
AND
PARKER
SPARTA
900
1100
1000
800
700
600
620
580

4

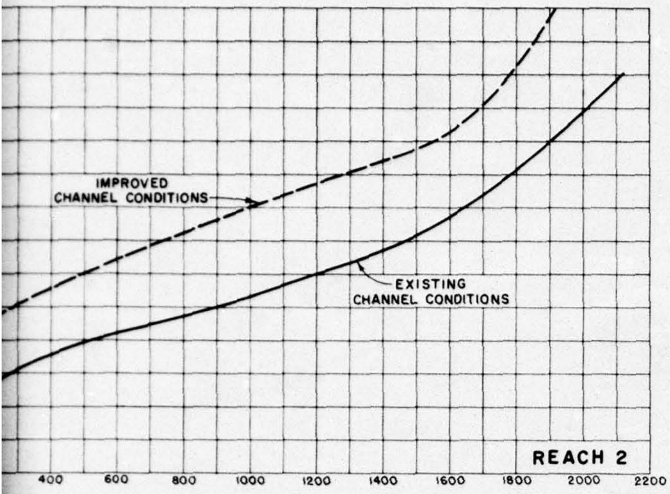

LEGEND
REACH 6 DAMAGE REACH
INDEX POINTS FOR DAMAGE REACHES
REACH 8
Canaseraga
Creek
White Bridge
South Sparta Cen
Woodsville
Dansville
1200
1000
900
800
700
600
1100
1300
601
608
620
626
638
597
BM 614
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
LOCAL PROTECTION PROJECT
CANASERAGA CREEK
DAMAGE REACHES
U.S. ARMY ENGINEER DISTRICT, BUFFALO

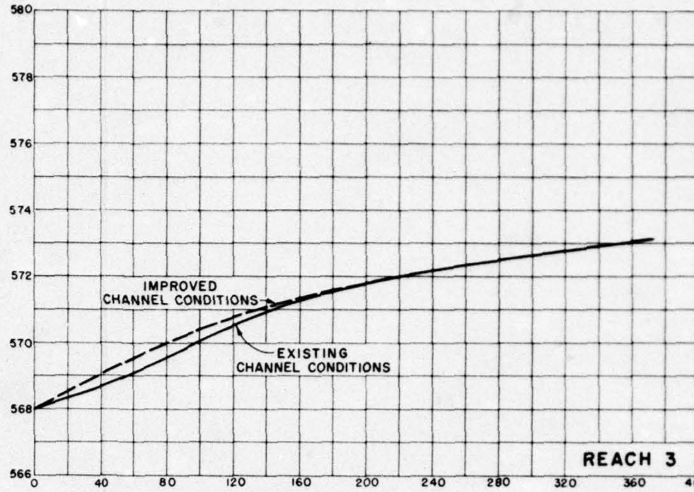
5

PLATE C15

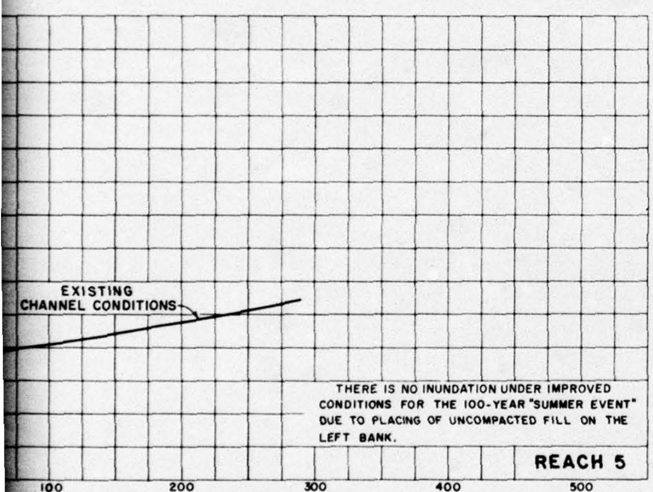


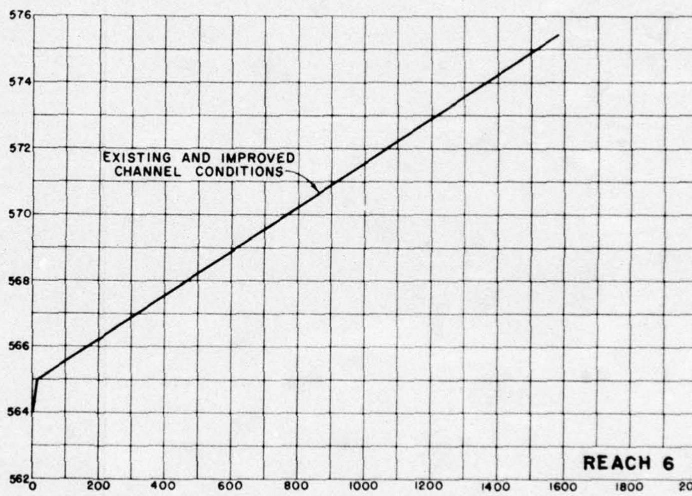
ELEVATION IN FEET USCGS DATUM
AREA INUNDATED
EXISTING AND IMPROVED CHANNEL CONDITIONS
REACH 1
IMPROVED CHANNEL CONDITIONS
EXISTING CHANNEL CONDITIONS
IMPROVED CHANNEL CONDITIONS
REACH 4
EXISTING CHANNEL CONDITIONS
LEFT BANK.
EXISTING AND IMPROVED CHANNEL CONDITIONS
REACH 7
EXISTING AND IMPROVED CHANNEL CONDITIONS
REACH 8
AREA INUNDATED IN ACRES



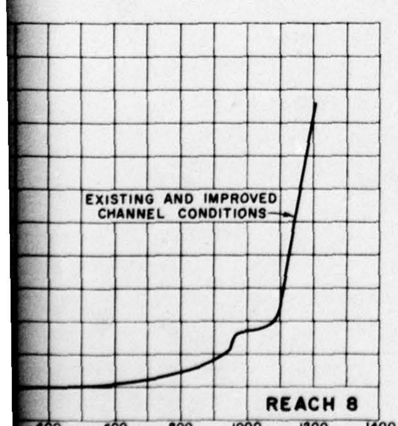


N D A T E D I N A C R E S





N D A T E D I N A C R E S



A T E D I N A C R E S

NOTES:

REACHES SHOWN ON THIS PLATE ARE REFERRED TO DAMAGE REACH MAP, PLATE C15.

INDEX POINT LOCATIONS

REACH 1 - ON CANASERAGA CREEK 1600' DOWNSTREAM OF THE CONFLUENCE WITH KESHEQUA CREEK.

REACH 2 - ON CANASERAGA CREEK 1400' DOWNSTREAM OF THE CONFLUENCE WITH KESHEQUA CREEK.

REACH 3 - 100' DOWNSTREAM OF PIONEER ROAD AND 1500' EAST OF STATE ROUTE 36.

REACH 4 - 100' DOWNSTREAM OF STATE ROUTE 258 ON STATE CANAL.

REACH 5 - ON CANASERAGA CREEK APPROXIMATELY 3500' NORTH OF EVERMAN ROAD BRIDGE AND 50' UPSTREAM OF AN EXISTING FARM BRIDGE.

REACH 6 - 100' UPSTREAM OF STATE ROUTE 258 ON STATE CANAL.

REACH 7 - 7200' DOWNSTREAM OF EVERMAN ROAD ON STATE CANAL.

REACH 8 - ON BRADNER CREEK 100' UPSTREAM OF EVERMAN ROAD.

A SLOPING POOL UNDER EXISTING CONDITIONS AND A LEVEL POOL UNDER IMPROVED CONDITIONS DUE TO MORE EFFICIENT CHANNELS NECESSITATED USE OF DIFFERENT STAGE-AREA CURVES IN REACHES 2,3 AND 4.

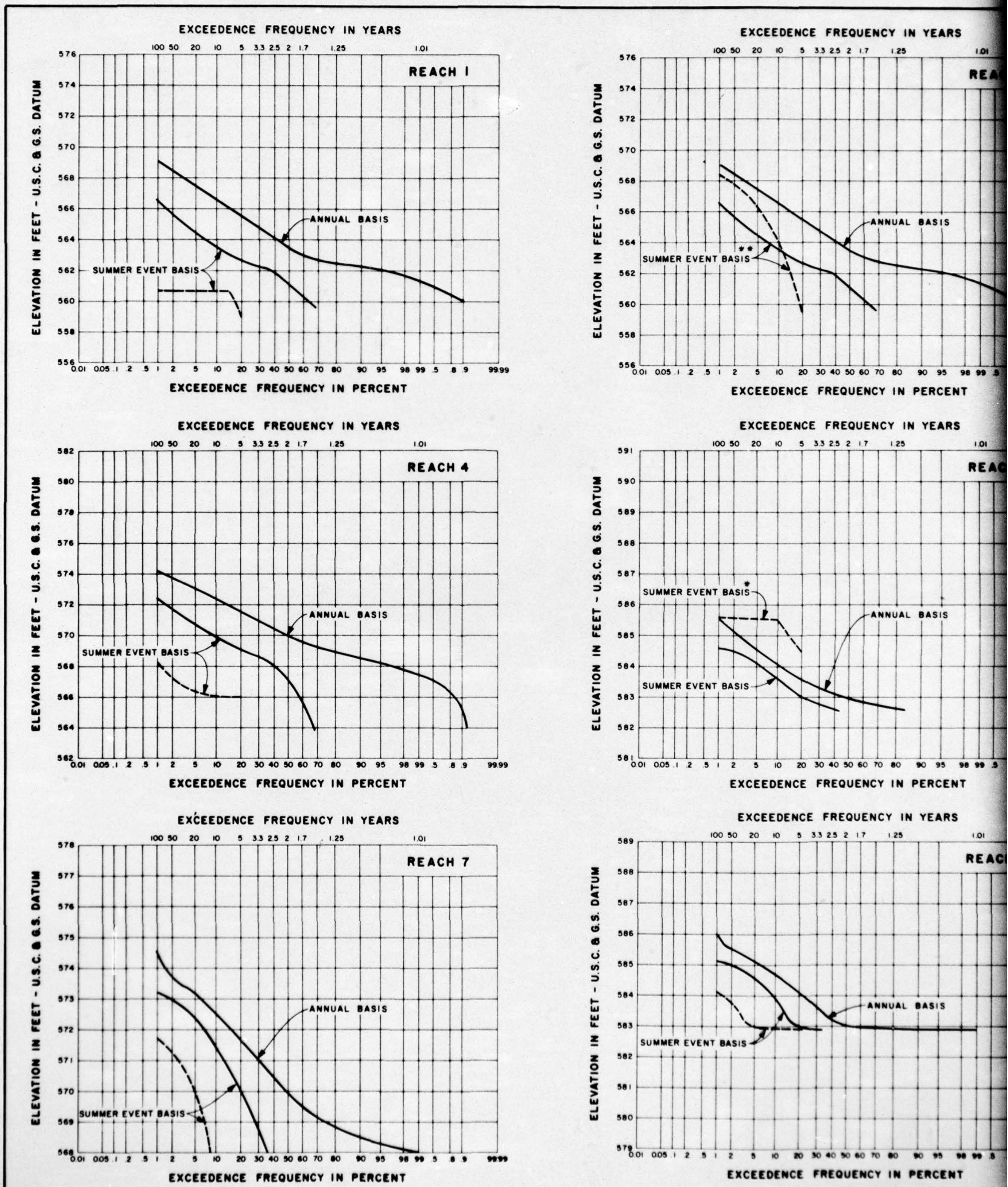
LEGEND

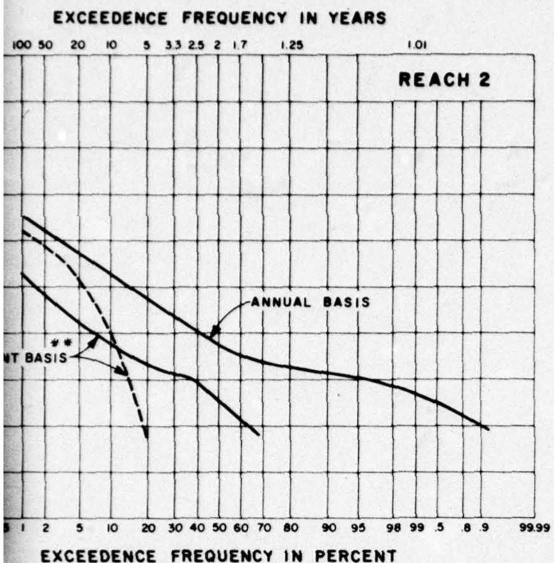
EXISTING CHANNEL CONDITIONS
IMPROVED CONDITIONS

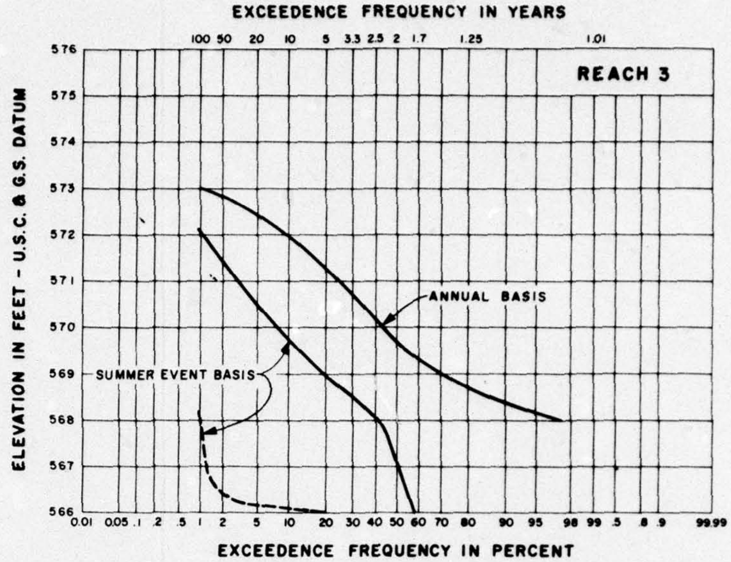
GENESEE RIVER BASIN
COMPREHENSIVE STUDY
NEW YORK AND PENNSYLVANIA
LOCAL PROTECTION PROJECT
CANASERAGA CREEK
LIVINGSTON COUNTY, NEW YORK

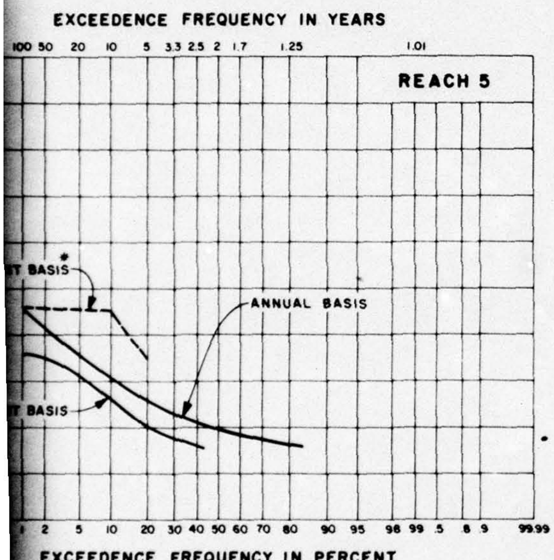
STAGE-AREA INUNDATED CURVES

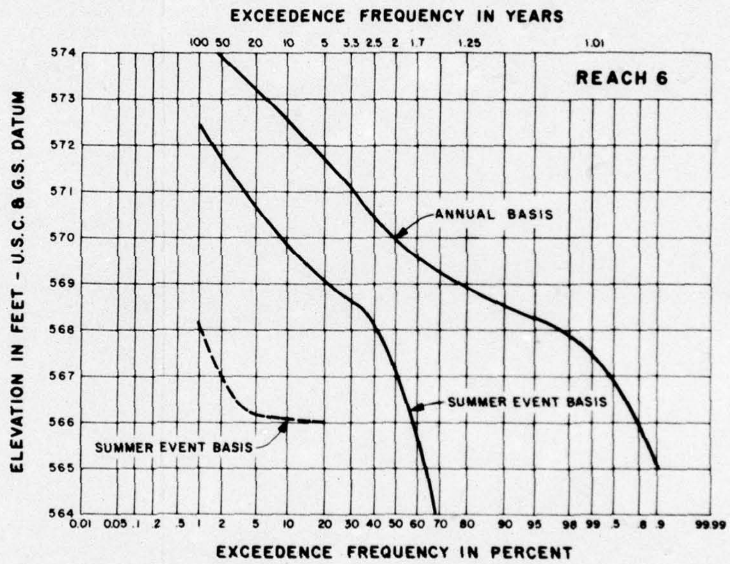
U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

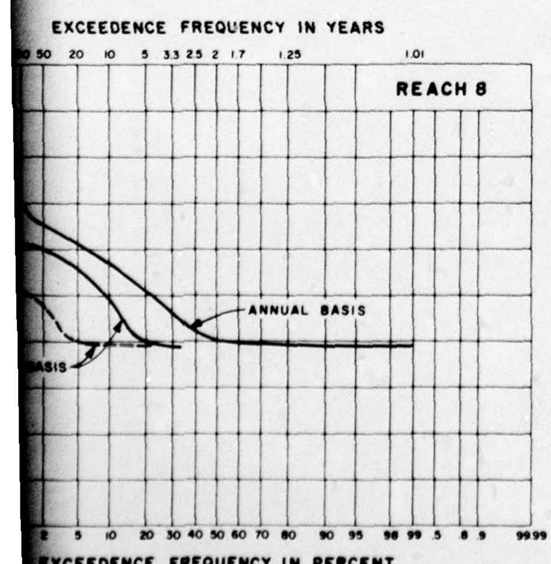

EXCEEDENCE FREQUENCY IN YEARS
100 50 20 10 5 3.3 2.5 2 1.7 1.25 1.01
REACH 1
ANNUAL BASIS
SUMMER EVENT BASIS
ELEVATION IN FEET - U.S.C. & G.S. DATUM
576 574 572 570 568 566 564 562 560 558 556
0.01 0.05 .1 .2 .5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 .5 .8 .9 99.99
EXCEEDENCE FREQUENCY IN PERCENT
EXCEEDENCE FREQUENCY IN YEARS
100 50 20 10 5 3.3 2.5 2 1.7 1.25 1.01
REA
ANNUAL BASIS
SUMMER EVENT BASIS
**
ELEVATION IN FEET - U.S.C. & G.S. DATUM
576 574 572 570 568 566 564 562 560 558 556
EXCEEDENCE FREQUENCY IN PERCENT
EXCEEDENCE FREQUENCY IN YEARS
REACH 4
ANNUAL BASIS
SUMMER EVENT BASIS
ELEVATION IN FEET - U.S.C. & G.S. DATUM
582 580 578 576 574 572 570 568 566 564 562
EXCEEDENCE FREQUENCY IN PERCENT
EXCEEDENCE FREQUENCY IN YEARS
REAC
SUMMER EVENT BASIS
*
ANNUAL BASIS
SUMMER EVENT BASIS
ELEVATION IN FEET - U.S.C. & G.S. DATUM
591 590 589 588 587 586 585 584 583 582 581
EXCEEDENCE FREQUENCY IN PERCENT
EXCEEDENCE FREQUENCY IN YEARS
REACH 7
ANNUAL BASIS
SUMMER EVENT BASIS
ELEVATION IN FEET - U.S.C. & G.S. DATUM
578 577 576 575 574 573 572 571 570 569 568
EXCEEDENCE FREQUENCY IN PERCENT
EXCEEDENCE FREQUENCY IN YEARS
REAC
ANNUAL BASIS
SUMMER EVENT BASIS
ELEVATION IN FEET - U.S.C. & G.S. DATUM
589 588 587 586 585 584 583 582 581 580 579
EXCEEDENCE FREQUENCY IN PERCENT











NOTES:

REACHES SHOWN ON THIS PLATE ARE REFERRED TO DAMAGE REACH MAP, PLATE C15

INDEX POINT LOCATIONS

REACH 1 - ON CANASERAGA CREEK 1600' DOWNSTREAM OF THE CONFLUENCE WITH KESHEQUA CREEK.

REACH 2 - ON CANASERAGA CREEK 1400' DOWNSTREAM OF THE CONFLUENCE WITH KESHEQUA CREEK.

REACH 3 - 100' DOWNSTREAM OF PIONEER ROAD AND 1500' EAST OF STATE ROUTE 36.

REACH 4 - 100' DOWNSTREAM OF STATE ROUTE 258 ON STATE CANAL.

REACH 5 - ON CANASERAGA CREEK APPROXIMATELY 3500' NORTH OF EVERMAN ROAD BRIDGE AND 50' UPSTREAM OF AN EXISTING FARM BRIDGE.

REACH 6 - 100' UPSTREAM OF STATE ROUTE 258 ON STATE CANAL.

REACH 7 - 7200' DOWNSTREAM OF EVERMAN ROAD ON STATE CANAL.

REACH 8 - ON BRADNER CREEK 100' UPSTREAM OF EVERMAN ROAD.

* ALTHOUGH THE STAGE IN REACH 5 IS HIGHER UNDER IMPROVED CONDITIONS THAN UNDER EXISTING CONDITIONS, CASTING OF CHANNEL EXCAVATED MATERIAL AS UNCOMPACTED FILL ON THE LEFT BANK WOULD PREVENT OVERBANK FLOODING.

* * ALTHOUGH THE STAGE AT I.P. 2 WOULD BE HIGHER UNDER IMPROVED CONDITIONS FOR A GIVEN EVENT, THE AREA INUNDATED FOR THE SAME EVENT WOULD BE LESS THAN UNDER EXISTING CONDITIONS BECAUSE OF THE LEVEL POOL.

LEGEND

———— EXISTING CHANNEL CONDITIONS

– – – – IMPROVED CONDITIONS

GENESEE RIVER BASIN
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CANASERAGA CREEK
LIVINGSTON COUNTY, NEW YORK

STAGE FREQUENCY CURVES

U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

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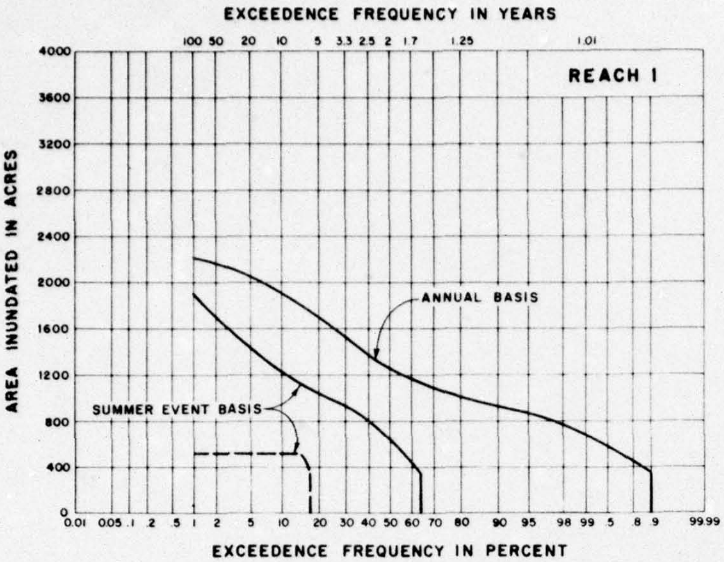
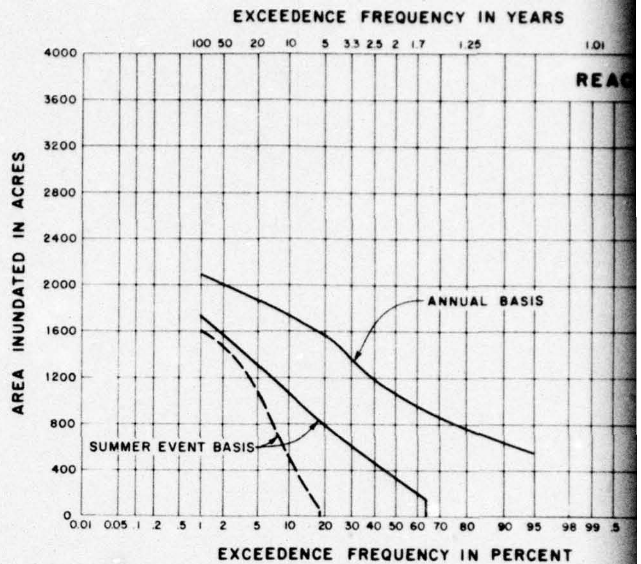
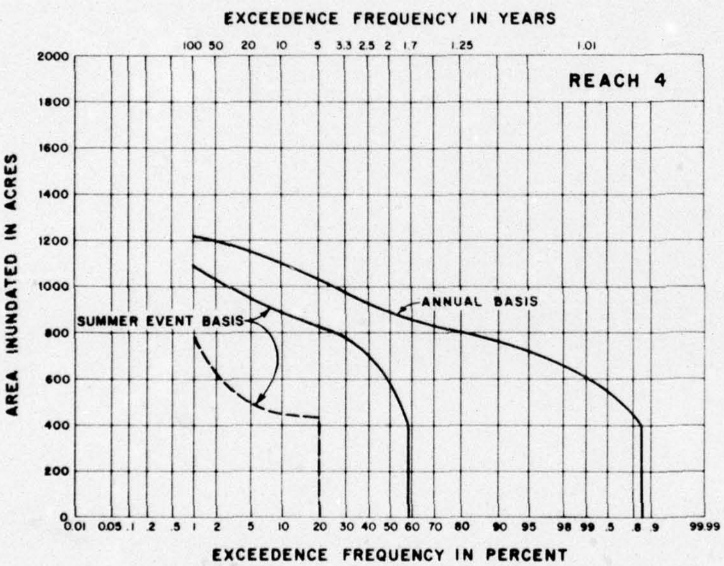
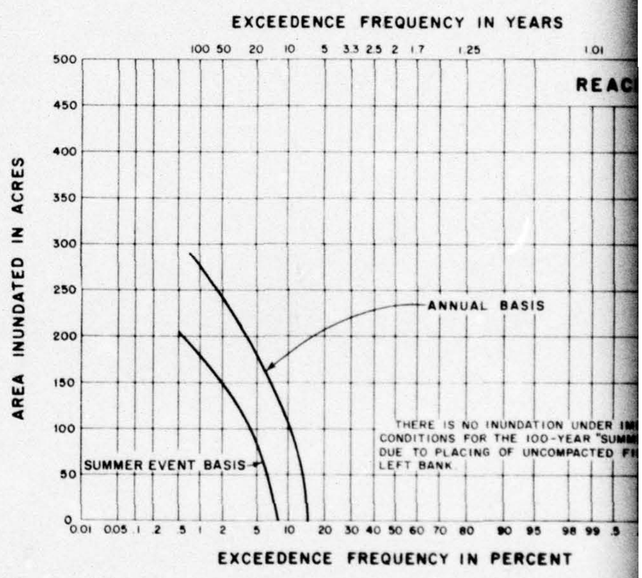
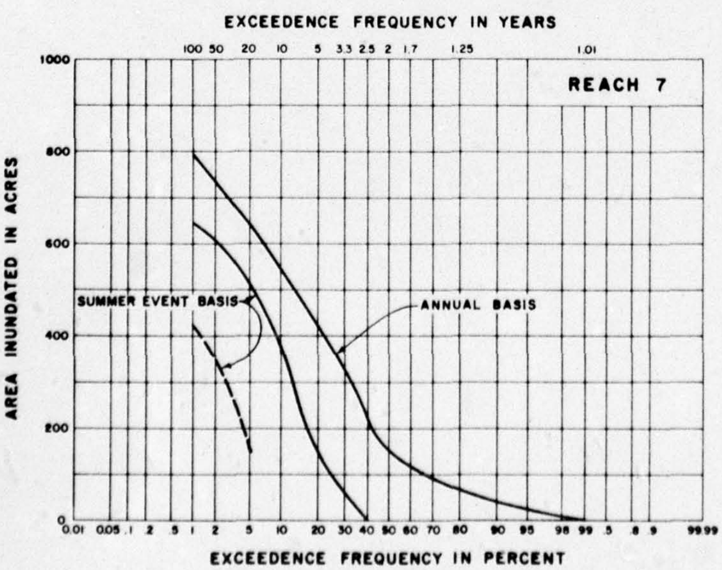
PLATE C17

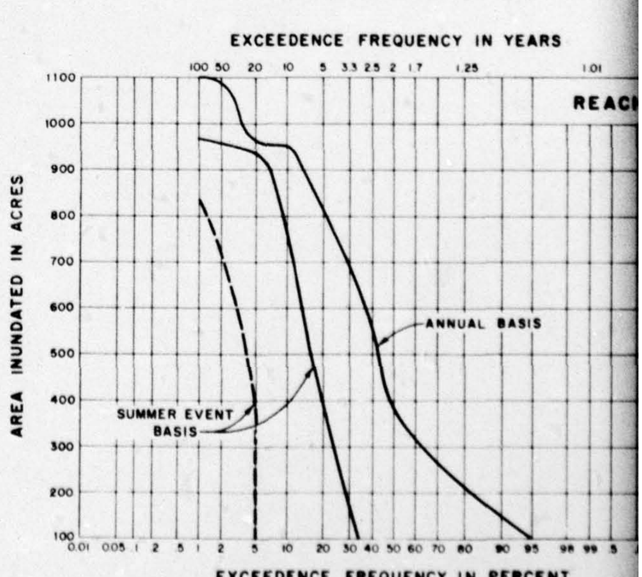

EXCEEDENCE FREQUENCY IN YEARS
REACH 1
AREA INUNDATED IN ACRES
ANNUAL BASIS
SUMMER EVENT BASIS
EXCEEDENCE FREQUENCY IN PERCENT

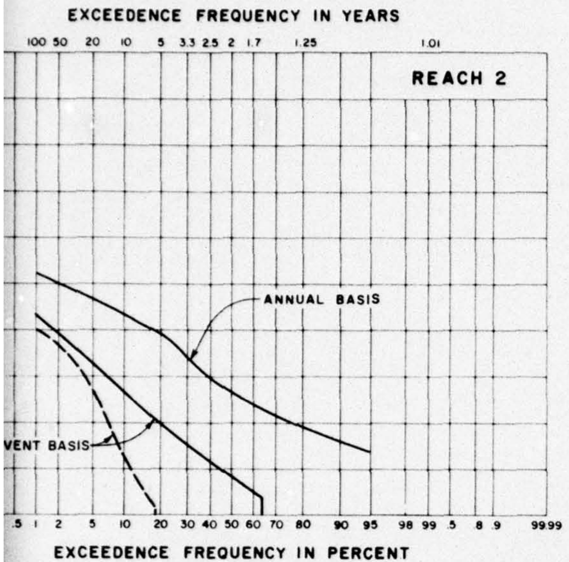

EXCEEDENCE FREQUENCY IN YEARS
AREA INUNDATED IN ACRES
ANNUAL BASIS
SUMMER EVENT BASIS
EXCEEDENCE FREQUENCY IN PERCENT

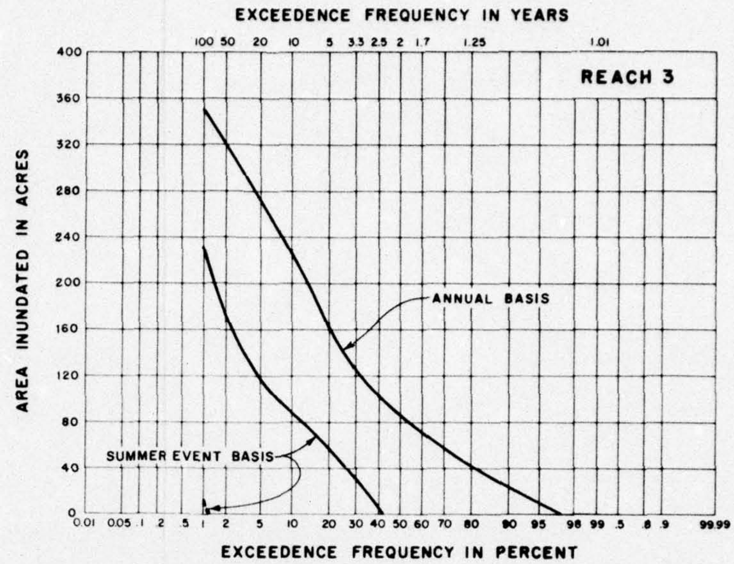

EXCEEDENCE FREQUENCY IN YEARS
REACH 4
AREA INUNDATED IN ACRES
ANNUAL BASIS
SUMMER EVENT BASIS
EXCEEDENCE FREQUENCY IN PERCENT

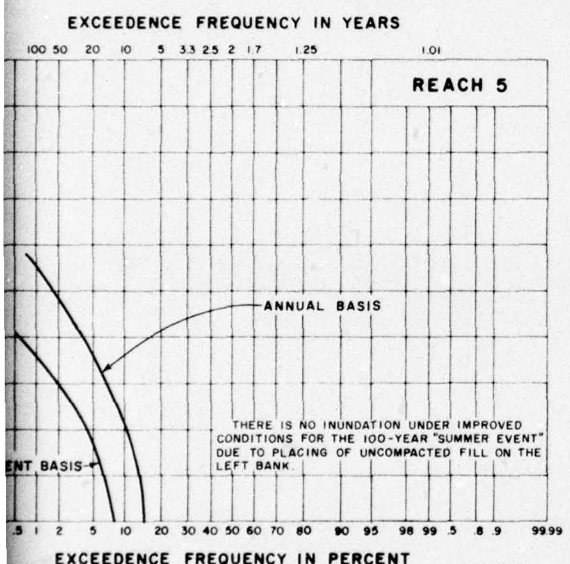

EXCEEDENCE FREQUENCY IN YEARS
AREA INUNDATED IN ACRES
ANNUAL BASIS
SUMMER EVENT BASIS
LEFT BANK.
EXCEEDENCE FREQUENCY IN PERCENT

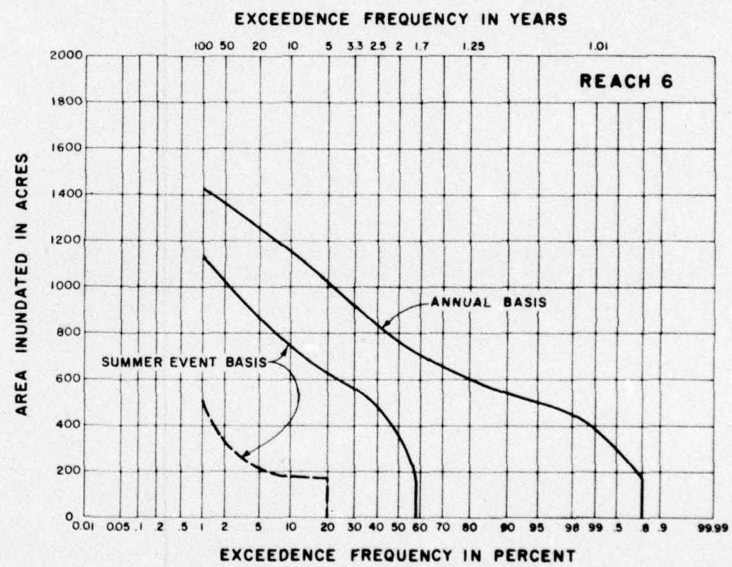

EXCEEDENCE FREQUENCY IN YEARS
REACH 7
AREA INUNDATED IN ACRES
SUMMER EVENT BASIS
ANNUAL BASIS
EXCEEDENCE FREQUENCY IN PERCENT

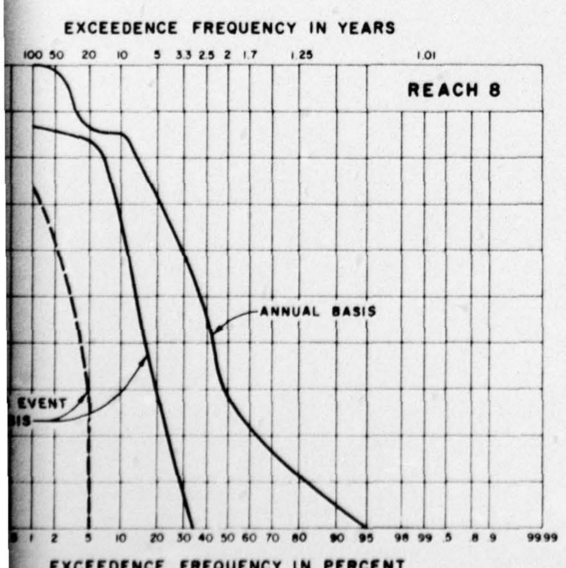

EXCEEDENCE FREQUENCY IN YEARS
AREA INUNDATED IN ACRES
ANNUAL BASIS
SUMMER EVENT BASIS
EXCEEDENCE FREQUENCY IN PERCENT











NOTES:

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INDEX POINT LOCATIONS

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REACH 6 - 100' UPSTREAM OF STATE ROUTE 258 ON STATE CANAL.

REACH 7 - 7200' DOWNSTREAM OF EVERMAN ROAD ON STATE CANAL.

REACH 8 - ON BRADNER CREEK 100' UPSTREAM OF EVERMAN ROAD.

LEGEND

EXISTING CHANNEL CONDITIONS

IMPROVED CONDITIONS

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COMPREHENSIVE STUDY
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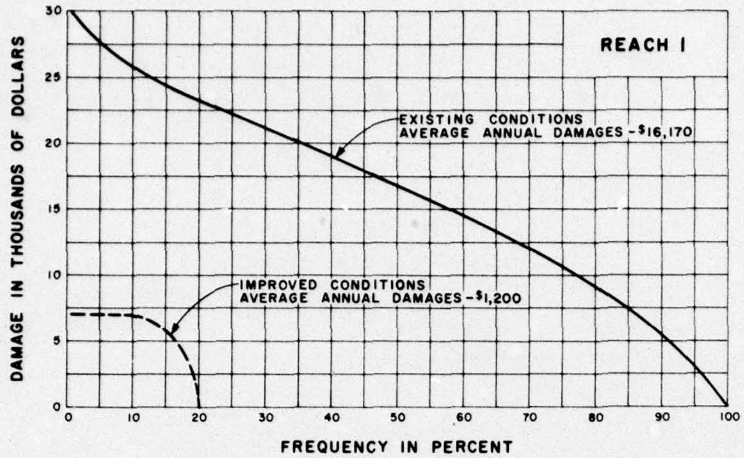
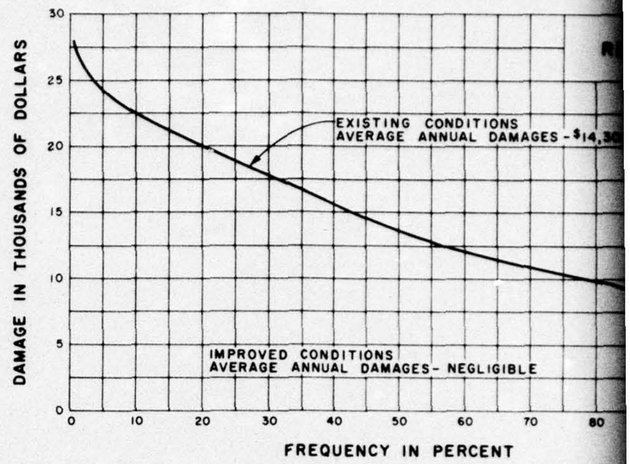
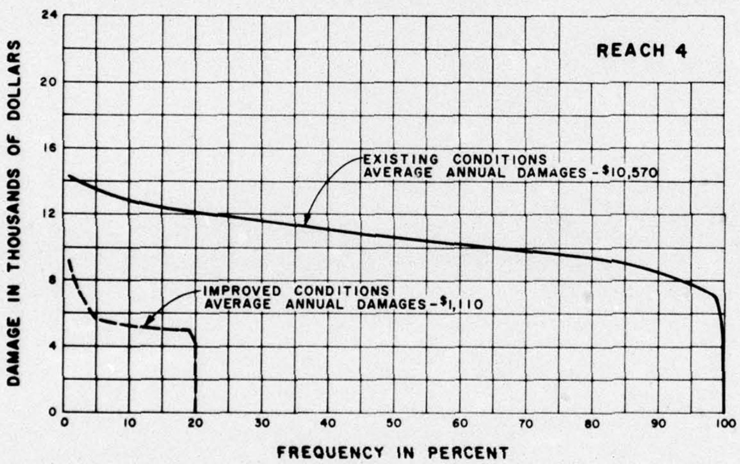
LOCAL PROTECTION PROJECT
CANASERAGA CREEK
LIVINGSTON COUNTY, NEW YORK

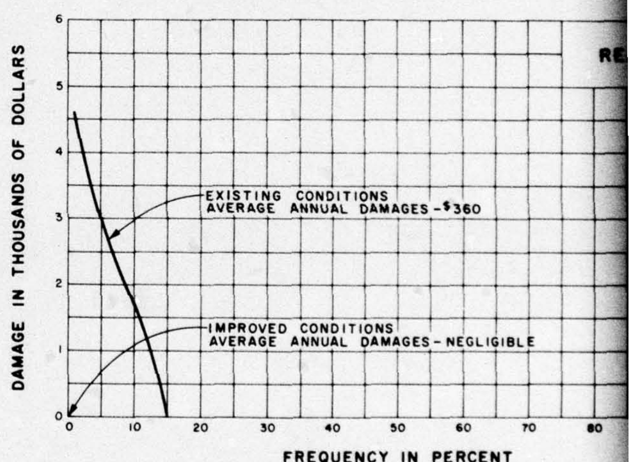
AREA INUNDATED FREQUENCY CURVES

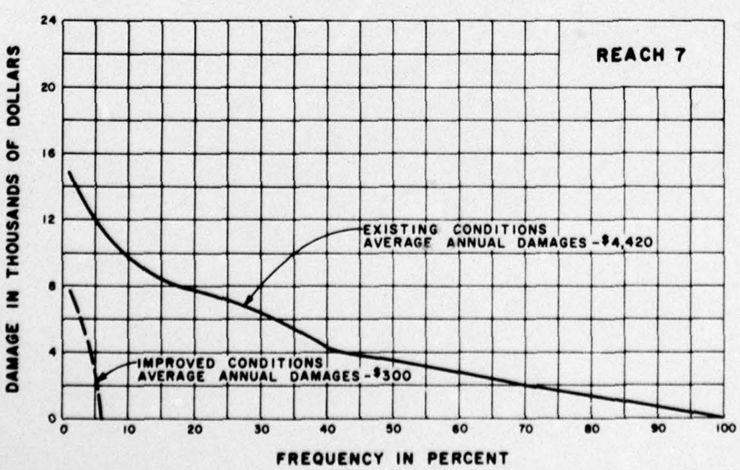
U.S. ARMY ENGINEER DISTRICT, BUFFALO
JUNE 1967

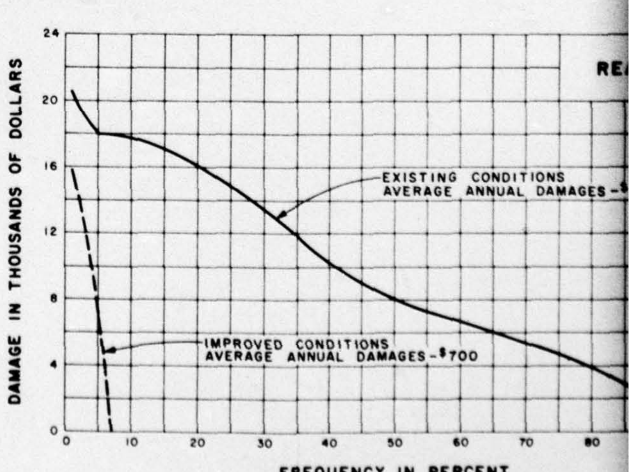

REACH I
EXISTING CONDITIONS
AVERAGE ANNUAL DAMAGES - $16,170
IMPROVED CONDITIONS
AVERAGE ANNUAL DAMAGES - $1,200
DAMAGE IN THOUSANDS OF DOLLARS
FREQUENCY IN PERCENT

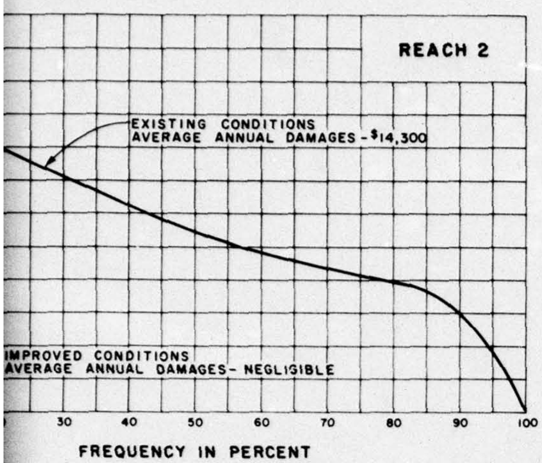

EXISTING CONDITIONS
IMPROVED CONDITIONS
AVERAGE ANNUAL DAMAGES - NEGLIGIBLE
DAMAGE IN THOUSANDS OF DOLLARS
FREQUENCY IN PERCENT

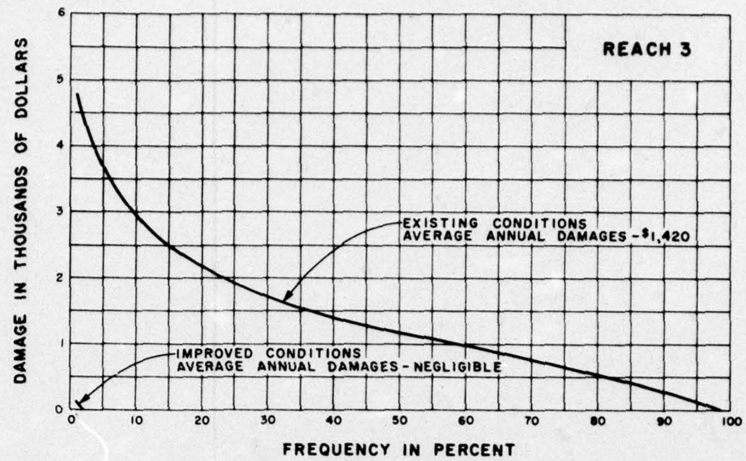

REACH 4
EXISTING CONDITIONS
AVERAGE ANNUAL DAMAGES - $10,570
IMPROVED CONDITIONS
AVERAGE ANNUAL DAMAGES - $1,110
DAMAGE IN THOUSANDS OF DOLLARS
FREQUENCY IN PERCENT

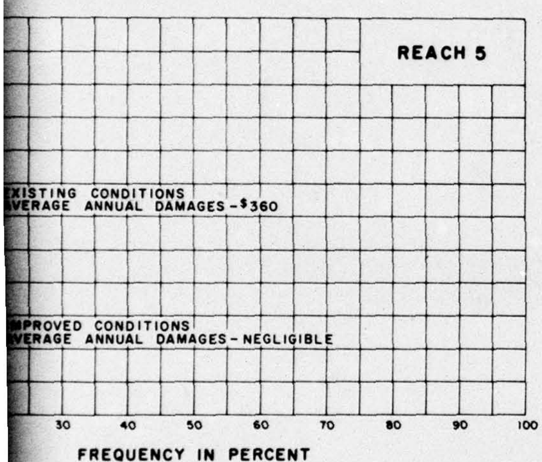

EXISTING CONDITIONS
AVERAGE ANNUAL DAMAGES - $360
IMPROVED CONDITIONS
AVERAGE ANNUAL DAMAGES - NEGLIGIBLE
DAMAGE IN THOUSANDS OF DOLLARS
FREQUENCY IN PERCENT

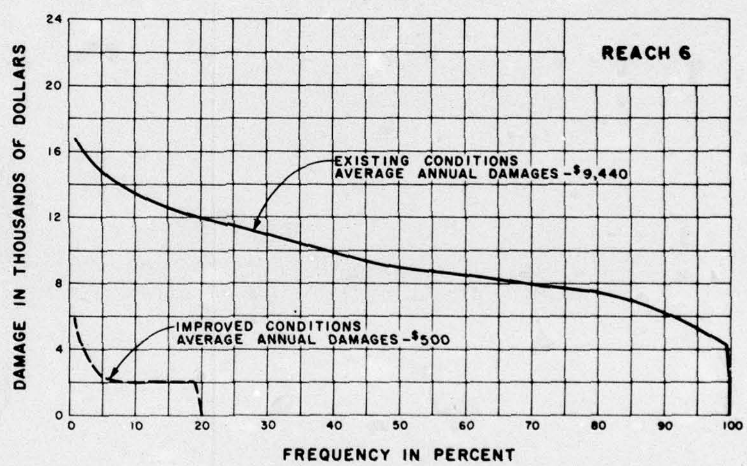

REACH 7
EXISTING CONDITIONS
AVERAGE ANNUAL DAMAGES - $4,420
IMPROVED CONDITIONS
AVERAGE ANNUAL DAMAGES - $300
DAMAGE IN THOUSANDS OF DOLLARS
FREQUENCY IN PERCENT

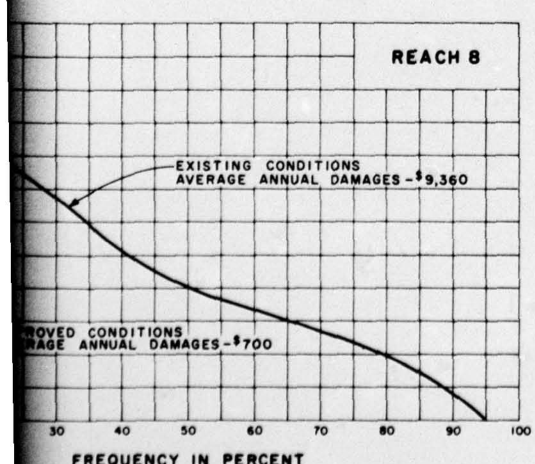

EXISTING CONDITIONS
IMPROVED CONDITIONS
AVERAGE ANNUAL DAMAGES - $700
DAMAGE IN THOUSANDS OF DOLLARS
FREQUENCY IN PERCENT











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REACH 8 - ON BRADNER CREEK 100' UPSTREAM OF EVERMAN ROAD.

LEGEND

——— EXISTING CHANNEL CONDITIONS

— — — IMPROVED CONDITIONS

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LIVINGSTON COUNTY, NEW YORK

FLOOD DAMAGE FREQUENCY CURVES

U.S. ARMY ENGINEER DISTRICT, BUFFALO

JUNE 1967

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